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Edison Free-Renewal Policies

As an index of the policies of some of the large Edison lighting companies in granting reductions in the price of tungsten lamps to customers, the short news item published elsewhere in this issue offers food for thought. Hartford, ever progressive, has placed all tungsten lamps of 60 watts rating and over on a free-renewal basis, while New York, Chicago and Brooklyn have placed the lower limit at 100 watts. Beyond that, however, there is a wide divergence in practice, and the keenness with which the company appreciates what is meant by public policy is reflected in the policy adopted. Without betraying a desire to have customers use lamps of large rating, the Brooklyn and Detroit companies offer all at the same price, knowing full well that human nature is frail enough to choose the largest if it costs no more than the smallest. The New York companies seek the same end but by different means, and it remains to be seen whether diplomacy will score over expediency. Some of the Edison companies have contented themselves with reducing the price of tungsten lamps following the cut made by the manufacturers without adopting any free-renewal policy whatever.

The Business Outlook

There are now up for consideration by Congress two momentous measures, neither of which, however, will materially affect the market for electrical goods directly. Changes in the tariff and the banking system of the nation necessarily cause stagnation in some branches of trade and stringency in the money market, because the manufacturer prefers to have on hand as little raw material as possible until he knows at what price he will have to market his product, and the jobber does not load up his shelves so long as there is any possibility of a new tariff depreciating the selling price of his goods by changing the cost of production. Fortunately these conditions have had little effect on the electrical industry, although apprehension has been expressed in some quarters and a degree of prudence has been exercised. True, owing to the high price of money, some of the large syndicates here and there are husbanding their resources and temporarily refraining from pushing into new fields; but the industry as a whole is advancing steadily without the slightest indication of retrenchment. The lighting companies are adding to their load curves and the manufacturers have never been more prosperous. Yet, in spite of this unique position which the electrical industry enjoys in the manufacturing and industrial world, with record-breaking sales and no signs of let-up, some of the seeds of pessimism which have produced tares in other fields have blown over into the electrical field and have taken root, but happily in rocky soil. The ghost of the tariff and the uncertainties of the banking system have caused needless fear. Years hence when the electrical industry shall have reached the saturation point these conditions may affect it; but at present, with the country only partially developed and untold millions still to learn of the advantages of electricity, the outlook is so glorious and the opportunities are so great that the wonder is that anyone seeking after facts should fail to perceive them. The electrical industry is immensely prosperous and is growing more and more so.

Substitute for Platinum

Among the problems encountered by the makers of large-size incandescent lamps or rectifying apparatus not the least important is that of obtaining an air-tight joint between the leading-in wires and the lamp or rectifier bulb. With small units satisfactory results are secured by the use of platinum of which the coefficient of thermal expansion is the same as that of the glass bulb. In addition to the high cost of the platinum, there are several reasons why this method is not equally satisfactory when applied to large units. In the *Digest* in this issue a brief description is given of a recent development in accordance with which tubular leading-in conductors of platinum, copper or other high-conductivity metal are employed instead of solid wires of platinum. The secret of the process lies in avoiding any appreciable local differences of temperature while making the seal. If the method proves as satisfactory in practice as one would be led to believe from the description, it will find wide application in the production of large lamps and rectifiers, with some possibility of causing the substitution of copper for platinum in small incandescent lamps.

Specifications for Street Lighting

The general discussion of the suggestions for specifications recently promulgated in England furnishes striking evidence of the great uncertainty of all problems relating to out-of-doors illumination. The various participants in the discussion seem to find very little common ground upon which to stand, each adhering to his own opinion until the end, thus leaving the subject in a less satisfactory state than appeared at the start. A fundamental difficulty with all attempts prroperly to define street illumination seems to be the great doubt as to what is really wanted, about which there is remarkable diversity of judgment. The British specification was based fundamentally upon horizontal illumination taken at 1 m above the ground. Now, this represents a condition which is undoubtedly simple to determine, but the measurement of horizontal illumination has little real meaning. It seems likely that for most practical purposes the vertical component of the illumina-

tion is more important than the horizontal in determining the visibility of things which one wishes to see. When the vertical component is taken its usefulness is limited to that portion of the light which proceeds in general from one direction. One does not see the face of a person by the light falling upon the back of his head. On the other hand, in the case of very dim lighting, in which silhouetting is a matter of some consequence, it is the diffused light from the ground level behind the object seen that is most important. One has, therefore, sorrowfully to admit that the solution of the street-lighting problem is indeterminate as regards the desired end. Before proceeding further in an effort to get out of the tangle it would seem advisable to secure first some general concurrence of opinion as to the end sought in furnishing light on the streets. Once this matter is settled, the data thus obtained will very much simplify the consideration of proper means for doing the lighting and suitable specifications to guide the contractor. The British controversy is both interesting and valuable and will tend to clear the way for more practical results in the future.

Will the Telephone Suit Be the Last?

The government has filed its petition in the long-expected anti-trust suit against the American Telephone & Telegraph Company. The suit is brought in the federal court for the Oregon district. The allegations on which it is based pertain to the acquisition by the Bell interests of certain independent telephone companies in the Pacific Northwest. The charges set forth are of that purport and tenor with which the public has become very familiar through wide discussion aroused by the long series of anti-trust cases considered by the courts in recent years.

The prayer of the petition in the present case asks among other things that the Bell companies be required "to dispose of the stocks, bonds and physical property thus illegally acquired to persons not connected with the Bell companies as stockholders or otherwise, and that so far as practicable competitive conditions be established as they were prior to such acquisitions."

The citizen who has had experience with "competitive conditions" in telephone service will think it ridiculous to talk about restoring them with all their confusion, waste and extravagance. Telephone service is essentially monopolistic in character, and when it is other than monopolistic in administration and control it is inefficient and costly. Of course the mere existence of monopoly will not insure efficient service and reasonable tolls; strict governmental regulation is essential. Monopolies are peculiarly sensitive to the kind of management they receive, whether good or bad. Yet governmentally enforced competition in the telephone service would be governmentally enforced extravagance.

In its prayer in this telephone suit the government asks the court to do what we believe would be a foolish thing. If sanctioned by a favorable decree from the bench, that thing would be intrinsically no less foolish. Yet we do not join with those who cry out at the department of justice for instituting these prosecutions and who are disposed to criticise the tendencies of recent anti-trust decisions of the Supreme Court. The statutes are such that neither the executive nor the judicial branch has any other course open to it. Nothing is to be gained by denouncing the courts for their interpretation of the law or the officers of the government for enforcing it. The trouble arises from the fact that, having adopted the policy of commission regulation of public utilities and natural monopolies, we still adhere to the theory of enforced competition prescribed in the Sherman anti-trust act.

In the end these cases themselves in the aggregate may become the evidence on which the court of public opinion will order a modification of our anti-trust laws. It is unthinkable that the American people—above all others a business nation—will much longer tolerate a condition of conflicting statutes under which business men are damned if they do, and ruined if they do not, conform to the workings of those natural laws which control commercial forces. It may not be unreasonable to hope that the telephone suit will prove to be the last bit of evidence called for by the court of public opinion in this great cause.

When the average man is told that our laws will be satisfied only with that sort of competition which calls upon him to have two telephones in his house when one should suffice, he may wake up. Once he is really awake to the situation the telephone user, the average citizen, will put an end to the nerve-racking ferment and hysteria caused by the spirit of the Sherman act and the spirit of the act to regulate commerce screaming at each other.

Self-Synchronizing Machines

It is well known that the ordinary synchronous alternating-current motor or converter requires some care and skill to bring it into synchronism, and that in this particular it is not so convenient to operate as is an induction motor. On the other hand, once the synchronous motor has been electrically locked to its circuit, it has distinct advantages over an induction motor, especially as regards its power-factor. In the last issue of the *Journal* of the (British) Institution of Electrical Engineers Dr. E. Rosenberg describes two interesting forms of synchronous machines that are self-synchronizing. One form is more particularly applicable to motors and the other to converters. In the self-synchronizing three-phase motor the field-magnet rotor is provided with a three-phase distributed winding in such a manner that if supplied with direct current from a separate exciter the regular field-magnet polarity is produced, but if short-circuited externally through a three-phase rheostat the rotor winding virtually becomes the secondary of an induction motor.

In order to start the motor, the three-phase stator winding is subjected to reduced line voltages by the use of a star-delta switch acting as a starting auto-transformer. The rotor windings are short-circuited through a three-phase rheostat. The machine then starts and accelerates as an ordinary three-phase induction motor with wound secondary. Meanwhile, the exciter is being accelerated likewise and is creating its own direct-current voltage. The exciter is now gradually inserted into the rotor circuit,

under cover of a reducing rheostat, thereby superposing increasing direct current and direct-current polarity on the three-phase induced currents and alternating-current polarity. Finally, when the machine has nearly reached synchronous speed, the direct-current polarity becomes predominant and the rotor jumps into synchronism.

The modifications required in the machine structure to make it self-synchronizing are a distributed rotor winding, an extra slip-ring, a three-phase rotor-starting rheostat, and also an exciter-introducing rheostat. With these modifications the starting process is rendered very simple, and the distributed rotor winding subsequently plays a useful part and acts as a damper, or synchronism preserver, in case of any accidental disturbance of frequency on the system.

In the single-phase self-synchronizing converter a small motor, which may be a single-phase commutating or series machine, is inserted between the step-down transformer secondary winding and the converter armature. This small motor, being on the converter shaft, supplies the initial accelerating torque. At the same time, the initial alternating current passing into the converter armature is restricted by the impedance of the single-phase starting motor. Consequently, the field-magnet windings permanently connected to the commutator of the converter are prevented from being excited powerfully enough to destroy their residual magnetism in the field-poles. As the machine comes up to speed the residual magnetism asserts its selective power, and the armature finally locks electrically to the alternating-current supply system without any undue sparking at the commutator brushes and without any fear of having the direct-current polarity reversed. The small starting motor is then cut out. In this case the modification consists of the small starting motor on the converter shaft, but some such accelerator is needed in the case of a single-phase converter, unless the starting can be effected from the direct-current side.

Graphical Statics Applied to Transmission-Line Calculations

The value of graphics in aiding the mind to grasp and deal with the problems of statics is so great and so well established as to have become axiomatic among engineers. Mr. Alfred Still has rendered all transmission-line engineers a service by indicating, in his article in this issue, the very simple and interesting geometrical relations which enter into the statics of every flexibly suspended conductor acted upon by gravitation alone, whether the form of the curve is a simple catenary, an elastic catenary or a parabola, and whether it be free or ice-coated. These geometrical relations are so simple and convincing that it becomes difficult to forget them once they have been apprehended.

From the use of the graphics outlined in Mr. Still's article follows the curious result that in almost any practical problem to which the method may be applied graphics will not be used and an arithmetical method will be substituted. The graphical relations will be present in the mind, however, and from the mental drafting-board the problem will be projected in arithmetical form. In other words, the salient principles of the statics of a transmission-line span are engraved on the mind in geometrical forms which are usually very compact and permanent, so that they are readily recalled when needed, whereas if the relations are apprehended in the first instance in non-geometrical terms, they are apt to be forgotten after a lapse of time.

The Disadvantage of Placing Single-Phase Mains in Iron Tubes

It is well known that when a long, straight insulated wire is placed at the axis of an iron tube and a continuous current is sent steadily along the wire the tube is subjected to a magnetic stress, or gradient of magnetic potential, and magnetic flux is set up therein, in loops or circles coaxial with the wire, through the substance of the iron walls. Theoretically in this simple case the presence of the iron tube does not modify the intensity of the magnetic field set up either inside or outside the tube. In other words, the tube merely intensifies the cylindrical magnetic flux within its own walls, without affecting the remainder of the cylindrical flux distribution.

If, however, we send an alternating current through the single wire at the axis of the tube, the magnetic field in the tube alternates and sets up eddy currents in the iron, to say nothing of hysteresis effects. These eddy currents react on the central wire. The result is sixfold. First, there is an increase in the active, or inphase, drop in potential along the wire. Second, there is an increase in the reactive, or quadrature, component of drop in potential along the wire. Third, there is a resultant increase in total drop of potential. Fourth, there is an increase in the active power lost in the wire, which is heated thereby. Fifth, there is a loss of active power in the iron tube, which is heated thereby, this rise in temperature of the pipe tending to enhance the rise in temperature of the inclosed wire. Sixth, the alternating magnetic field external to the tube is distinctly affected and ordinarily diminished. Any single-phase single current inside an iron conduit, pipe or tube brings about, therefore, some additional heating, drop of potential and waste of energy.

If, however, both the going and returning insulated conductors of a single-phase system, or the three insulated conductors of a three-phase system, are inclosed in one and the same iron tube, the resultant magnetic field in the iron tube wall is comparatively feeble; so that the extra heating and losses are ordinarily insignificant. Some experimental results completely confirming the well-known doctrine above outlined were recently published by Dr. L. Bloch in the *Elektrotechnische Zeitschrift*, which article is now translated and abstracted in the London *Electrician* as alluded to in this week's *Digest*. The article shows that the drop of potential in single alternating-current wires in an iron tube may be more than ten times as great as for the same wires carrying direct current, while the rise of temperature may be increased several-fold. On the other hand, brass-coated paper tubes had but slight extra alternating-current losses in them.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Pennsylvania Utility Bill Signed

Governor Tener of Pennsylvania affixed his signature to the public utilities bill on July 26, and the names of the seven commissioners who will administer the law will be announced shortly. The law, which was outlined in these columns in the issue of July 19, becomes operative on Jan. 1, 1914, but the commission has authority to organize and select its employees on or before Oct. 1, 1913. The State Railroad Commission having been legislated out of office on July 1, it is expected that the new commission will organize promptly and take up pending cases transferred to it by the Railroad Commission.

Demonstration of Panama Lock Control Board

On Monday of this week the General Electric Company demonstrated for the benefit of editors of the technical press and officials the control board for operating the Gatun locks of the Panama Canal. For this purpose the board was partly set up in the switchboard shop of the Schenectady works and one section was wired. The board shows graphically the operation of the various valves, fender chains and guard and main gates, together with the rise and fall of the water levels. To guard against any false move so far as the sequence of operations is concerned, the entire system of control is interlocked. Small synchronous motors operating in synchronism with the 50-hp motors at the gates are employed to duplicate the action at distant points on the benchboard, which is a miniature of the lock itself. The board is now being dismantled for shipment. The boards for the Miraflores and Pedro Miguel locks will follow in a month or two.

Edison Companies Reduce Price of Tungsten Lamps

On Aug. 1 a great many of the licensee Edison companies placed in effect new tungsten-lamp prices for customers entitled to free renewals of carbon-filament lamps. Strange to say, there is no unanimity in the price schedules, although some of the companies operating in large cities, such as the New York Edison Company, the Commonwealth Edison Company of Chicago, the Edison Electric Illuminating Company of Brooklyn and others, have placed all tungsten lamps of 100-watt rating and larger on a free renewal basis. The Brooklyn Edison company is among the most progressive in its attitude on the lamp question, selling 10, 15, 25, 40 and 60-watt lamps, whether plain or frosted, at a uniform price of 20 cents. The Detroit Edison company has pursued a similar policy and has made arrangements with one of the local firms handling tungsten lamps to renew all tungsten lamps for its customers at a uniform rate of 30 cents regardless of size. The New York Edison Company and the United Electric Light & Power Company have adopted a graded scale of prices which is peculiar in that the smaller the lamp the higher the price. The schedules for both companies are as follows: 10-watt lamp, 28 cents; 15-watt lamp, 25 cents; 25-watt lamp, 18 cents; 40-watt lamp, 16 cents; 60-watt lamp, 14 cents. For frosted lamps an extra charge of 2 cents above the foregoing prices is made. The Buffalo General Electric Company sells clear-bulb tungsten lamps rated at 25 watts to 40 watts for 30 cents and other sizes as follows: 60-watt, 35 cents; 100-watt, 65 cents; 150-watt, 95 cents, and 250, 400 and 500-watt lamps at $1.60, $2.90 and $3.20 respectively. Reductions have also been placed in effect in Philadelphia, St. Louis, Boston, Minneapolis and Cincinnati. The Hartford Electric Light Company some time ago placed tungsten lamps of 60-watt rating and over on a free renewal basis.

Overhead-Line Dispute at Glenwood Springs

Aug. 14 has been set by the District Court for hearing the suit of the Glenwood Light & Water Company against the Mutual Light, Power & Utility Company, both of Glenwood Springs, Col. It is contended that the erection by the latter company of its distribution lines on the same side of alleys occupied by the former company has resulted in such close proximity of primary and secondary lines that the life of linemen is endangered. The Glenwood Light & Water Company as prior occupant seeks to compel the Mutual company to remove its poles and lines to the opposite side of the alleys. The Rocky Mountain Fire Underwriters have also called attention to the life and fire hazards existing because of the present spacing of wires.

Change in Control of Springfield and Worcester Railways

By purchasing the controlling interest in the common stock of the electric railways in Springfield, Worcester and environs owned by the New England Investment & Security Company, Messrs. Sanderson & Porter, of New York City. will add these properties to the rest of their utilities. The New England Investment & Security Company was organized in 1906 to acquire the electric railways in Massachusetts controlled at that time by the New York, New Haven & Hartford Railroad Company. and the latter company guaranteed interest on the bonds and dividends on the preferred stock. The Springfield system comprises 166 miles of track, and the Worcester system 266 miles.

A Year's Record of Electrical Fires in Chicago

During the year 1912, according to the records of the Department of Electricity of Chicago, there were seventy-one fires due to electrical causes, with a total loss of $29,-152.50, or an average of about $410 for each fire. It is instructive to note the causes of these fires as tabulated. Eleven were due to low-tension wires short-circuited; six to burnouts of motor armatures; six to flatirons left in circuit; five to short-circuits in lamp cords; four to short-circuits on conduit; three to ignition of films on motion-picture machines, and three to inflammable material about incandescent lamps. The remaining electric fires were due to a wide variety of causes. Only one fire caused a serious loss, and in this case the fire was thought to have been caused by a short-circuit in the lamp cord attached to a portable lamp. The branch circuit was over-fused. In this case the loss was estimated at $20,000. The loss from the other seventy fires averaged a trifle over $130.

Government Suit Against the A. T. & T. Company

On July 24 suit was filed in the District Court of the United States for the district of Oregon by the United States District Attorney, in behalf of the federal government, against the American Telephone & Telegraph Company. The bill of complaint names in addition to the American company six of its subsidiary companies operating on the Pacific Coast, eleven independent telephone companies operating in the same territory and twenty-five individual defendants, including the president of the American company and its seven vice-presidents. The bill in general charges the defendants with restraining trade and commerce in the transmission of telephonic messages and with monopolizing such commerce in violation of the act of July 2, 1890.

Prior to 1905, the bill of complaint sets forth, the Bell companies owned and operated substantially all means of telephonic communication between the States of Oregon, Washington, Montana and Idaho. It is charged that the service given by the Bell companies at that time was inefficient and unsatisfactory, and that in consequence independent companies were formed to give local and long-distance service in competition with the Bell companies. These independent lines were gradually formed into interstate systems, of which there were finally three, the Northwestern Long Distance Telephone Company, the Interstate Consolidated Telephone & Telegraph Company, and the Independent Long Distance Telephone Company.

The bill states further that the construction of the independent lines in many respects is superior to that of their competitors and declares that their service was more efficient. They also used automatic telephones, affording secrecy in communication, which the government states was a popular feature and in demand by the public. Automatic service, however, was not given by the Bell companies.

Among the alleged unlawful acts with which the defendants are charged are the following: The Bell companies by reducing rates below a paying basis at some points, by giving free service at others, and by threatening to do these things at still other places, forced certain of the independent companies to violate their contracts for connections with the Northwestern Long Distance Company and to give their business exclusively to the Bell companies. It is charged that in some places where connections were severed in this manner the public authorities required them to be restored, but after such restoration all interstate messages were sent by the Bell companies over their own lines unless the senders specifically requested otherwise. In certain instances, so the government charges, representatives of the Bell companies frequently stated to patrons of the Northwestern company that the latter did not serve certain points with which they desired to communicate, when in fact it did. The Bell companies are also charged with urging the independent company of Seattle and other independent companies to violate their contracts for interchange of business with the Northwestern company, and in some instances with agreeing to pay counsel fees and other expenses incurred by them in litigation resulting from such breach of contract.

Among the independent companies which it is charged the Bell system acquired unlawfully are the following: The Independent Telephone Company of Seattle, the Home Telephone Company of Puget Sound, controlling interest in the Northwestern Long Distance Telephone Company, controlling interest in the Interstate Consolidated Telephone Company, and the Independent Long Distance Telephone Company of Idaho.

It is also charged that the treasurer of the Northwestern company entered into an agreement with the Bell companies to deliver to them at least two-thirds of the stock and all of the bonds and the physical property of his company. To this end, it is declared, he failed to pay interest due on the bonds, although sufficient funds were available, and foreclosure proceedings were then brought against the Northwestern company, which are now pending. The government charges that unless these proceedings are restrained the property of the Northwestern company may be sold thereunder and thereby interfere with the effectiveness of any court judgment in the present case.

The bill prays that the court adjudge the defendants guilty of conspiracy to restrain and monopolize interstate trade and commerce in violation of the anti-trust law; that the purchase of the securities and property of the several independent companies named be decreed unlawful and in violation of the anti-trust act; that the Bell companies be required, subject to the approval of the court, to dispose of securities and property so acquired to persons not connected with the Bell companies as stockholders or otherwise; that competitive conditions as they formerly existed be re-established as far as practicable, and, if necessary to the public interest, that a receiver be appointed to take possession of such securities and physical property.

W. E. Robertson on the Cost of Membership in the Society for Electrical Development

The cost of participation on the part of jobbers and contractors in the work of the Society for Electrical Development has been fixed at one-twentieth of 1 per cent on the gross sales. To some 0.05 per cent on sales seems to be a substantial tax on the cost of doing business, and many hesitate to commit themselves to a contribution of this amount.

A correct analysis of the purpose of the contribution will take it out of the "cost-of-doing-business" column and place it properly where it belongs, that is, in the "creating-a-larger-market" column. Few, if any, contractors or jobbers have such a column in their ledgers, but it is high time such a column were provided, as it is of great importance to all to provide an increased market in which each may participate.

An appropriation of from 1-300 to 1-400 of 1 per cent of the expense account of jobbers and contractors is equivalent to one-twentieth of 1 per cent on the sales. Viewed from this standpoint the cost of co-operation in creating an increased market is infinitesimal.

The average cost of doing business over a period of years on the part of both contractors and jobbers is from 15 to 20 per cent of the sales, and heretofore this entire amount has been spent in securing business on a competitive basis, and nothing has been spent in increasing the total demand.

It has never been possible in the history of civilization to secure co-operative effort on the part of an entire industry, the reason being the very old one that human nature is so distrustful of the future as to make it exceedingly difficult to get men as a class to part with a present tangible dollar for the purpose of securing, and in fact positively insuring, many future dollars.

The impossibility heretofore of overcoming this stupidity on the part of men should not prove detrimental, as an increasing confidence in one's fellow-men, added to an ever increasing intelligence, has prepared our industry to do what has never before been done. By its repeated accomplishment of the so-called scientifically impossible, the electrical industry, more than any other, has stirred the imagination of those connected with it, and one has but to mention the incandescent lamp, the telephone, the X-ray and the wireless telegraph to establish the truth of this statement.

Since our industry as a whole owes its existence to the demonstration that what was formerly impossible is now possible, it is logical to believe that the imagination of the jobbers and contractors has been sufficiently aroused, and their faith in the integrity of the administrative details of the society has become sufficiently strong, to warrant the

belief that from 1-300 to 1-400 of the cost of doing business will be set aside for the purpose of increasing the sum of the opportunity to do business, leaving the other 299-300 or 399-400 of the cost to be used in its present and former channels.

Does not the history of the industry and the smallness of the stake to participate warrant the risk? I am of the belief that the subscriptions will be forthcoming when the logic of participation and the infinitesimal cost thereof are thoroughly understood.

Engines at Panama Pacific Exposition

A conspicuous feature of the display in the department of machinery exhibits at the Panama-Pacific International Exposition, to be held in San Francisco in 1915, will be the presentation of the methods of power development which have been evolved in recent years. The exposition is to be a contemporaneous one and not of a historical character, and the evolution of the steam engine, which was the work of the last century, will have only a very small part to play. The exhibits will include a number of oil engines, operating upon California crude oils, which form such a large part of the resources of the State. The development of this type of motor has been somewhat checked in the past year by increasing prices of fuel oil, and this result is inevitable as increased use is made of it.

In the original conception of the Diesel engine it was anticipated that pulverized coal could be used as the fuel in the cylinder of the engine in the same manner as the liquid fuel is now used. It was found, however, that the residual ash from the solid fuel made this impossible. There is being tried out in England to-day an engine of 100 hp in which powdered coal fed by worm screw through tubular openings in the cylinder head is heated by the exhaust gases and the air supply for the engine drawn through the coal in such a way as to form producer gas, which is utilized in the engine in the same manner as it would be in the ordinary gas engines. The range of fuel with which such an engine can be operated is much wider than that of the Diesel type, and it is expected that among the exhibits at the exposition it may have its place and will represent the latest development in prime movers.

Exhibit of German Safety Appliances

The great movement for safety which has been occupying so prominent a place in European industrial and commercial life for many years is now making itself manifest in "safety first" campaigns in the larger industrial enterprises throughout America. Upon the solicitation of the American Museum of Safety, New York City, the Allgemeine Elektricitäts Gesellschaft has shipped to this country a most complete array of protective devices, insulated linemen's tools, sanitary equipment and instructive models, such as are used in protecting and educating the German industrial worker. This exhibit of safety appliances will be shown at the International Exposition of Safety and Sanitation to be held at the Grand Central Palace in New York City, Dec. 11 to Dec. 20, 1913, with the hope of bringing the American manufacturer face to face with his duty in protecting his workmen.

Much attention has been given to displaying devices for protecting the electrical workman. On one board have been grouped such tools as pliers, bolt cutters, S-wrenches and socket wrenches, the handles of which are insulated with hard rubber or with vulcanized rubber as the case may demand. Another panel carries an assortment of sockets, push-buttons, switches and cut-outs, the safety features of which lie in the fact that each piece of apparatus is colored to indicate the rating of the device so that the workman will soon come to associate danger with certain colors and will instinctively avoid them in his work. A third panel similar to the foregoing carries out this same idea in a display of porcelain insulators. An entire switchboard fully equipped, a set of choke coils and electrolytic lightning arresters with all of the modern protective devices were included in the shipment and will be used to give the exhibit a touch of station realism. Rubber gloves with long gauntlets and insulated wooden tongs for handling live high-potential leads are provided as adjuncts to the insulated linemen's tools.

Looking toward the solution of a distinctly German problem, the Allgemeine Elektricitäts Gesellschaft has evolved an original scheme for diminishing the extensive use of alcoholic beverages among its workmen in order to reduce the number of accidents. Four times each day drinks are sold in bottles by the company to the workmen. Beer and milk may be had at a price of 2.5 cents a bottle, while soda, seltzer and soft drinks are sold for 1.25 cents a bottle. This scheme is reported to have decreased the beer drinking in the works by 33 per cent since it was inaugurated less than one year ago. A system of charts and price lists illustrating this system are included in the exhibit.

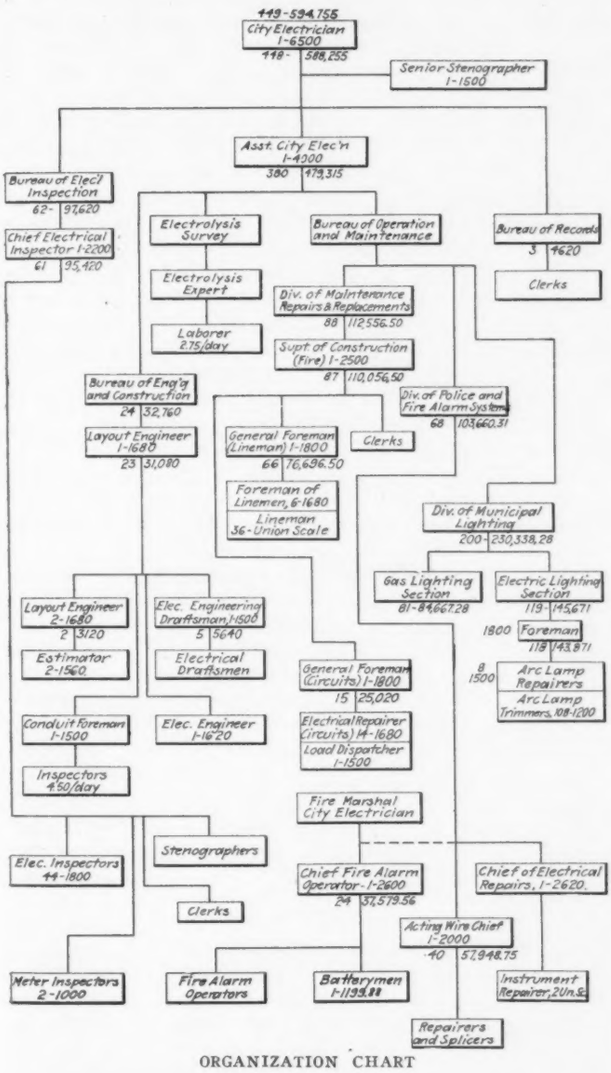
In view of the fact that more than 40,000 workmen are killed and 2,000,000 injured in industrial accidents in the United States every year, it would seem that any attention American manufacturers may give to the German methods of safeguarding human life and any effort they may make to reproduce these methods or better ones in our factories would be well worth while.

Reorganization of the Department of Electricity, Chicago

Organized in 1898, the Department of Electricity of the city of Chicago was for several years an operating and maintenance department having supervision principally of the municipal street lighting, electrical inspection and the bureau of fire-alarm telegraph and police telephones. Within the last two years, however, the scope of the department has broadened, and it is now doing engineering, construction and rate-research work. Mr. Ray Palmer, the city electrician, wrote to the Civil Service Commission of the city of Chicago on Aug. 30, 1912, asking that a thorough investigation be made, with a view toward a reorganization of the department as a more efficient and economical working force. He asked that an assistant city electrician be appointed so that the city electrician could be relieved of much of the detail work, enabling him to give his time to the general building up of the department and to the study of the city's future electrical problems. The investigation of the organization of the Department of Electricity, made public on July 7, was carried on by Mr. J. L. Jacobs, efficiency engineer of the Civil Service Commission, and a number of changes have been made, the organization now being as indicated in the accompanying chart.

The work of the Department of Electricity divides itself into four natural bureaus—the bureau of electrical inspection, the bureau of engineering and construction, the bureau of operation and maintenance, and the bureau of records. In addition there is the separate electrolysis survey. The appropriation for the electrolysis expert is made under the bureau of engineering of the Department of Public Works, but the work is performed under the supervision of the city electrician. Entries on the chart are based on the appropriation ordinance for the year 1913. The number of positions and the total salary appropriated are indicated by the figures given. The salary of the city electrician is $6,500 a year and that of the assistant city electrician $4,000. Mr. A. C. King is the present assistant city electrician.

Under the bureau of operation and maintenance are included three distinct divisions—those of "maintenance, repairs and replacements," "municipal telephone and telegraph systems" and "municipal lighting." The office of inspector of gas and gas meters will probably be abolished and the office of superintendent of gas and electric lighting will be created at a salary not exceeding $3,000. In the division of fire-alarm, police and other municipal telephone and telegraph systems it is recommended that the number of fire-alarm operators be reduced to seven and that the new position of wire chief be created. The larger part of the work of the division of maintenance, repairs and replacements will be repairing, with some new work in connection



ORGANIZATION CHART

with street-lighting extensions and the new construction and maintenance of fire-alarm and police telephone systems. It is recommended that the bureau of interior wiring be abolished.

The bureau of engineering and construction, with an electrical engineer in charge, is to have charge of the estimating, inspection and laying out of routes of new circuits for street lighting and also the construction work. The head of this bureau will necessarily work in conjunction with the superintendent of construction of the division of maintenance.

The bureau of electrical inspection, in charge of the chief electrical inspector, issues permits to do electrical wiring and certificates of inspection, and makes inspection of wiring and equipment. It maintains a testing laboratory. It is also proposed to create a meter-testing division. The Civil Service Commission recommends that the office of assistant chief electrical inspector be created.

The bureau of records, in charge of the head clerk, takes care of the general clerical work of the department.

Additions to Dam Structure at Fremont, Ohio

An addition is being made to the dam structure of the Sandusky River Power Company at Fremont, Ohio. This hydroelectric development has been under the supervision of the W. H. Schott Company, Chicago. The dam, seawall and generating station were completed at the time the floods occurred in the Central States in April, with the exception of the installation of the machinery. The river, which was higher during the floods than at any other time of which there is record, overflowed the seawall, carrying away the earth embankment back of it and widening the river channel at this point considerably. Although the dam structure was not injured, it became imperative to extend the dam so as to span the new channel. This addition necessitated extending the dam 160 ft., making a total length of 450 ft. The flood-gate section was increased 200 per cent and the spillway section was increased 50 per cent. When the entire plant is completed it will have a rating of 6000 hp with a head of 40 ft. The dam with its extensions will be capable of taking care of a maximum flow of 45,000 cu. ft. per second. Electricity will be generated at 18,000 volts, three-phase, 25 cycles. It is hoped that the station will be furnishing energy early in this month.

Option of A. T. & T. Company on Chicago Automatic Telephone Service

At a meeting of the committee on gas, oil and electric light of the City Council of Chicago on July 24 the fact was brought out that a tentative agreement has been reached by which the American Telephone & Telegraph Company agrees to purchase the telephone property of the Chicago Tunnel Company under certain conditions for $6,300,000. The Chicago Tunnel Company is the successor of the Illinois Telephone & Telegraph Company and operates an automatic telephone service in the central portion of Chicago, serving between 20,000 and 30,000 subscribers. The tunnels of the Chicago Tunnel Company under the central portion of the city are utilized for the telephone cables. The Chicago Tunnel Company is not making money and is anxious to sell to the A. T. & T. Company, which controls the Chicago Telephone Company. Mr. C. W. Hotchkiss, president of the Chicago Tunnel Company, in a letter to the committee says that the receivers of the Illinois Telephone & Telegraph Company and the reorganized company, now known as the Chicago Tunnel Company, have expended $5,441,000 on the present automatic telephone-exchange system in Chicago. In addition, the valuation of the old plant was $2,000,000, so that the total present valuation is $7,441,000. This does not include interest on investment nor a loss to Mr. Joseph Harris, of the Automatic Electric Company, the contractor in rehabilitating the plant of the Chicago Tunnel Company, of $400,000. Negotiations for the sale of the automatic telephone system of the Chicago Tunnel Company were begun more than six months ago, and on July 8 an agreement tantamount to an option to buy on the part of the American Telephone & Telegraph Company was reached, the price fixed being $6,300,000. Mr. Schuyler and Mr. David W. Fairleigh, of Louisville, counsel for Mr. Harris, addressed the committee. The latter said that it would probably require an additional investment of from $15,000,000 to $20,000,000 to make a comprehensive automatic telephone system for Chicago. He added that the American Telephone & Telegraph Company owns a number of automatic telephone plants outside of Chicago

and that if it purchases the automatic exchanges in Chicago it may use some of the apparatus elsewhere.

The aldermen were very much interested in knowing what portion of the telephone property of the Chicago Tunnel Company would be added to the equipment of the Chicago Telephone Company and capitalized for rate-making purposes. The lawyers for the Chicago Tunnel Company were not prepared to answer this question. There was considerable discussion, and City Electrician Palmer was called in to advise the committee. The committee finally adopted a motion requesting the Chicago Tunnel Company to furnish an inventory and appraisal of its telephone property. The city electrician was instructed to go over the inventory and appraisal and report to the committee as to what portion of the property he considered useful to the Chicago Telephone Company.

Proposed Absorption of Competing Telephone Service in Chicago

Mr. D. J. Schuyler, Jr., a lawyer, appeared before the committee on gas, oil and electric light of the Chicago City Council on July 14 and said that tentative negotiations were under way for the sale of the telephone plant of the Chicago Tunnel Company to the Chicago Telephone Company. Mr. Schuyler appeared on behalf of the Tunnel company. The ordinance under which the telephone business of the Tunnel company is operated was adopted originally in 1899 and prohibits the sale of the business to a competing company without the consent of the City Council. Mr. Schuyler said that the negotiations had proceeded to a point where the Chicago Tunnel Company had agreed to sell and the Chicago Telephone Company to buy the telephone property of the former, provided a price could be agreed upon and provided the consent of the city could be obtained. He said the basis of sale, if made, would be the appraised value of the property, and that the Tunnel company did not wish to go to the expense of making an appraisal unless assured that the city was willing that the transfer should be made.

The freight-transportation business of the Chicago Tunnel Company is not involved in the proposed deal. The Tunnel company operates an automatic telephone exchange, competing with the Chicago Telephone Company and serving the central portion of the city. It has about 30,000 subscribers and the Chicago Telephone Company has about 329,000 subscribers. The price for unlimited service by the automatic company is $85 a year, and by the Chicago Telephone Company $125 a year. Mr. Schuyler said that the Chicago Telephone Company is controlled by the Chicago Utilities Company, which has issued bonds having a par value of $5,000,000 or $6,000,000.

Mr. L. G. Richardson, counsel for the Chicago Telephone Company, said that under no circumstances did his company wish to buy the telephone rights of the Chicago Tunnel Company; it might buy the property used in the telephone work. Mr. Richardson said he presumed a considerable saving could be made by using the tunnels for the wires and cables of the Chicago Telephone Company.

In answer to a question Mr. Schuyler said that the Chicago Tunnel Company's connections with outside independent telephone toll-line companies were not very extensive. Alderman Martin J. Healy raised the point that the proposed absorption of the competing company by the Chicago Telephone Company would be a blow to the independent telephone interests throughout the country. Other aldermen thought the existence of two telephone systems in one city a nuisance. Alderman James B. Bowler contended that the city should be prepared to wipe out competition if it insisted on regulation. On his motion consideration of the matter was deferred, with the idea that the Tunnel company might come before the committee later with a fixed valuation.

Public Service Commission News

Vermont Commission

Governor Fletcher has removed Chairman Charles D. Watson and asked for the resignation of Mr. W. R. Warner, of the Public Service Commission, in pursuance of a campaign for lower telephone rates. The third member of the board, Mr. G. H. Babbitt, recently resigned. Present difficulties began two months ago when the Governor called upon the commission to investigate complaints regarding the service and rates of the New England Telephone & Telegraph Company and allied organizations. The commission has not yet reported upon the matter, and a short time ago the Governor appointed Messrs. H. F. Graham and J. H. Cook a special commission to investigate the telephone situation throughout the State. Following the removal of Chairman Watson, the Governor named Mr. Robert C. Bacon, of Brattleboro, as chairman of a new board.

Massachusetts Commission

Mayor John F. Fitzgerald of Boston, Mass., has filed a petition with the Gas and Electric Light Commission contending that the prices charged by the Edison Electric Illuminating Company of Boston should be reduced and asking for a public hearing upon the issue. The petition states that the company has a surplus of $616,212 in the present year after paying dividends of 12 per cent and contends that the charges should be reduced to the lowest possible figure consistent with a reasonable dividend to the stockholders.

Consumers of service furnished by the Newburyport Gas & Electric Light Company have petitioned for a reduction in the price of gas and electricity. A petition has also been presented to the board from various consumers of electric service in the city of Taunton requesting the commission to determine the maximum price at which electricity shall be furnished by the municipal lighting plant. It is contended that by the scheme of management now in vogue the private consumers of electricity in the city bear the major part of the maintenance cost of the plant, divided between municipal and commercial service, and that the price of electricity is greatly in excess of its fair market value and not only constitutes an excessive burden to present users but also is a deterrent against the use of electricity by others. An associated petition sets forth that a material reduction is about to be made in the price of electricity for motor service and asks the board to determine whether the proposed reduction in rates for motor service is for the best interests of taxpayers and citizens at large.

Wisconsin Commission

The Wisconsin Railroad Commission has dismissed the application of the Fort Atkinson Water & Light Commission for authority to increase its rates for electric service outside the corporate limits of the city of Fort Atkinson. The chief reason advanced by the city for such an increase was that the consumers involved are not city taxpayers and consequently should pay more for receiving the conveniences of electric service from the municipal plant. The commission pointed out that, in order to promote the welfare of its residents, a municipality may own and operate a utility, and may grant to the consumers thereof certain advantages to which they would not ordinarily be entitled if served by a privately owned utility. That is, if a city and its taxpayers have relinquished the profits which would ordinarily be earned if the service had been rendered by a private utility, it would appear just and reasonable to extend the benefits only to the consumers situated within the city and not to those consumers who take no share in the risk and whose property does not stand security for the payment of bonds or of delinquent debts. On investigation, however, it was found that the present revenues from commercial lighting are considerably in excess of the cost of

producing the service with interest at 4 per cent and taxes at 1.5 per cent. The revenue from consumers outside the city was also greater than the total cost of furnishing such service even with interest at 7.5 per cent and depreciation, taxes and interest allowed upon a separate appraisal of the property used in supplying service outside the city. Inasmuch as the revenues from the out-of-town consumers would be sufficient to pay for the costs of service were the plant privately owned, the commission held that no reason existed for increasing them. Attention was called to the fact that the present schedule for commercial lighting is inequitable as between individual consumers inasmuch as it takes into account only the quantity of energy consumed by each. Although no request was made for a reduction in rates, the commission recommended schedules for city and non-resident consumers which will effect a reduction in rates for the former. The schedule prescribed for resident consumers is as follows: Primary rate, 10 cents net per kw-hr. for the first thirty hours' use per month of the active connected load; secondary rate, 6.5 cents net for the next sixty hours' use of the active connected load; excess rate, 4.5 cents net. The corresponding rates for the out-of-town consumers are to be 12 cents, 8 cents and 5.5 cents respectively. The division of consumers into classes according to the percentage of their active connected loads is the same as has been noted in previous decisions of the commission. The recommended rates for energy for motor service for consumers within the city are as follows: A fixed charge of 50 cents net per month per active hp connected, plus a meter charge of 3.5 cents net per kw-hr. The corresponding charges for non-resident consumers would be 60 cents and 4 cents. The active connected load is to consist of 90 per cent of the first 10 hp nominal rating of the total connected load; 75 per cent of the next 20 hp, 60 per cent of the next 30 hp, and 50 per cent of all over 60 hp. In addition to the above schedules, the commission recommended a lower rate for street lighting. The city was ordered to purchase all meters now owned by consumers or to pay such consumers a reasonable rental for meters owned by them. In lieu of meter rentals hitherto charged there is to be substituted a minimum charge of 60 cents per meter for resident consumers and 75 cents per meter for non-resident consumers. It is stipulated in the decision that if the municipality decides to put any of the schedules recommended into effect, all must be put into effect.

The Wisconsin Commission has handed down its decision in the matter of the complaint by citizens of Lake Geneva alleging that the rates charged by the Equitable Electric Light Company are excessive. The investigation showed that the company supplies a comparatively large number of consumers who maintain summer homes in the vicinity of Lake Geneva and demand a higher class of service than is usually rendered by the small utility. On account of the relatively high cost of service occasioned by this demand, the commission departed somewhat from its usual practice and differentiated in its prescribed schedule of rates between resident and non-resident consumers. No change, therefore, was made in the present rate of 15 cents per kw-hr. in so far as it applies to the out-of-town consumer, but a slight reduction will be effected by the following schedule which was prescribed for residents of Lake Geneva: Primary rate, 14 cents net per kw-hr. for the first 30 hours' use per month of the active connected load; secondary rate, 12 cents net per kw-hr. for the next 60 hours' use; excess rate, 8 cents net. In Class A, consisting of residences, the active load is to be taken as 60 per cent of the first 500 watts and 33⅓ per cent of the excess; in Class B, consisting of banks, offices, stores, shops, depots, etc., 70 per cent of the first 2.5 kw and 55 per cent of the excess is to be the active load; in Class C, consisting of public buildings, schools, churches, hotels, clubs, etc., 55 per cent of the connected load is to be active. The minimum bill is to range from a charge of 60 cents for a connected load of 1 kw or less to a charge of $2.25 for a connected load of over 5 kw. The company's schedule for motor service, ranging from 7.5 cents to 4 cents per kw-hr., was ordered abandoned and the following schedule substituted: A service charge of 75 cents per active hp per month; an energy charge of 5 cents net per kw-hr. for the first 50 hours' use per month of the active hp and an excess rate of 3 cents net. The percentage active is to be determined as follows: 90 per cent of the first 10 hp; 75 per cent of the next 20 hp; 60 per cent of the next 30 hp; 50 per cent of all over 60 hp. The above schedule will effect an increase in the revenue from motor service. The commission pointed out that one reason for the high operating costs in the present case was to be found in the inefficient plant equipment, and methods were suggested for improvement.

Current News Notes

FIRE LOSSES IN PHILADELPHIA.—Mr. J. S. Mallory, of the Philadelphia Fire Prevention Commission, in speaking of the methods adopted in the Philadelphia fire prevention crusade said faulty electric wiring and conduits and loose and lax methods for caring for the transmission of electricity contributed largely to the excessive fire losses of that city. The annual fire loss in Philadelphia exceeds $3,000,000.

* * *

DRY SEASON IN CALIFORNIA AND NEVADA.—That the water supply of Lake Tahoe will be insufficient for power purposes this year is the statement made by the engineers of the Truckee River General Electric Company, Reno, Nev., after making examinations, surveys and collecting data and statistics on the present supply of water in the lake. Plans are being laid to meet the emergency, but it is conceded that the outlook is very gloomy.

* * *

EXAMINATION FOR RADIO SUB-INSPECTOR.—The United States Civil Service Commission will hold an open competitive examination on Aug. 20, 1913, for radio sub-inspector. The eligible candidate appointed to this position will receive $6 a day in the New York Navy Yard, and the assistant radio sub-inspector will receive $4 a day. For theoretical and practical questions in the construction, use and adjustment of radio apparatus and auxiliaries sixty credits will be allowed, and forty for technical training and experience.

* * *

EFFICIENCY IN TECHNICAL AND TRADE JOURNALISM.—A feature of the annual convention of the Federation of Trade Press Associations in the United States at the Hotel Astor, New York, Sept. 18, 19 and 20, will be fifty ten-minute addresses making up symposiums on vital questions affecting all those who have dealings with the business press of America. At an inspirational mass meeting addresses will be made by representative business and professional men on subjects of live interest to manufacturers and publishers.

* * *

EXAMINATION FOR RADIO ELECTRICIAN.—An open competitive examination for radio electrician will be held Aug. 20 by the United States Civil Service Commission. From the register of eligible candidates certification will be made to fill a vacancy at $4.48 a day in the New York Navy Yard. The examination will consist of practical questions upon the construction, use and adjustment of radio apparatus and auxiliaries, and fifty credits will be allowed for experience in the line of the required duties. Form 1312, to be had from the United States Civil Service Commission, Washington, D. C., will give further particulars.

Old-Time Telegraphers to Meet.—A reunion of the Old-Time Telegraphers' and Historical Association will be held at Detroit from Aug. 26 to Aug. 28. Mr. F. J. Scherrer, 30 Church Street, New York, is secretary and treasurer of the association.

* * *

Machinery Building at San Francisco to Be Finished Soon.—In the course of an after-luncheon address before the City Club of Chicago on July 28 Dr. Frederick Vining Fisher, lecturer for the Panama-Pacific Exposition of 1915, said that Machinery Hall at the exposition would be finished in October of this year. Only machinery in operation will be shown. In all departments no award will be given to an exhibit over ten years old; the aim is to make the exposition very modern.

* * *

Electric Locomotive Head-Lamps in Illinois.—At the recent session of the General Assembly of Illinois a bill was passed providing for more powerful head-lamps on railroad locomotives. The law seems to be construed as a demand for the use of electric head-lamps. The State Board of Railroad and Warehouse Commissioners has decided, however, that the railroads shall be given a reasonable time to comply with the new law and that no prosecutions shall be begun until further orders from the board.

* * *

Electrically Heated Schoolhouse.—Rupert, Idaho, is the principal town on the North Side Minidoka irrigation project of the United States government. Two years ago a school building was erected at a cost of $16,000. Six months after completion this building was outgrown, and a contract has been let recently for a new schoolhouse to cost $46,000. Electricity is furnished at very low rates by the Government Reclamation Service, and the whole building will be heated as well as lighted by electricity. Fresh air will be blown over electric-heating units, and thus the heating and ventilating will be combined. In addition to the heating equipment, the school will have a household economics room equipped with a large electric range and twelve individual electric stoves. There will also be a large water heater for supplying hot water for all purposes in the building, including the baths for the gymnasium.

* * *

Minnesota Critics of Governor Dunne.—According to the Chicago newspapers a number of citizens of St. Paul and Minneapolis have united in a letter to Governor Dunne of Illinois criticising him severely for signing the public-utilities bill. These gentlemen, if correctly quoted, regard the creation of the State Public Utilities Commission of Illinois as a "flagrant violation of the principle of home rule in government," and as a movement "notoriously in the interest of the exploiting public-service companies of Illinois." The statement continues: "In signing this bill you have not only betrayed your own people of Chicago, but by your example you have given substantial aid and encouragement to the public-service-company philistines in Minnesota now working through the state machine and plutocratic newspapers to put over similar legislation in this State." The letter is said to be signed by Messrs. S. A. Stockwell, Albert W. Rankin, Stiles P. Jones and a number of other citizens.

* * *

The Deadly Curve-Drawing Meter.—Not long ago a Pennsylvania central-station company received a report of poor service from a local bookstore and dispatched one of its inspectors with a recording voltmeter to make a test of the pressure regulation on the premises. The inspector reached the store in the middle of a busy afternoon when the place was full of customers, and, not wishing to interfere with the merchant's business, connected up the meter in a small closet at the rear of the shop, afterward leaving without explaining to anyone what he had done. Next morning when everything was comparatively quiet the loud ticking of the clock in the closet aroused first the curiosity and then the terror of the clerks. After a hasty investigation they telephoned the police to send someone to take charge of the "infernal machine" they supposed they had discovered. A convenient bathtub was being filled with water to douse the electric bomb when the company's inspector happened in, just in time to prevent the unwonted bath which his pet recording voltmeter was about to receive.

* * *

SOCIETY MEETINGS

Electrical Workers' Convention at Boston.—The International Brotherhood of Electrical Workers will hold its biennial convention at Boston, Mass., during the week of Sept. 15. Mr. J. W. O'Donnell, 987 Washington Street, Boston, Mass., is secretary of the organization.

* * *

Convention of the New England Section, N. E. L. A.—The fifth annal convention of the New England Section of the National Electric Light Association will be held at the Hotel Vermont in Burlington, Vt., Sept. 17, 18 and 19. Papers on electrical subjects of national interest are being prepared by authorities in New England and an entertainment committee is arranging to make the three days' stay one of special enjoyment.

* * *

Galveston Jovians.—At the meeting of the Jovian Lunch Club of Galveston on July 21 there were a number of out-of-town visitors, including Messrs. Arthur Binz, Edward Hale, Lee Johnson, F. B. Hathaway, B. S. Craig, William Archibald and Ray Schneider, all of Houston. Mr. K. E. Mason, secretary of the Brush Electric Company of Galveston, demonstrated the use of the pulmotor, using Mr. Hale as a subject. The next meeting will be held on Aug. 21.

* * *

Maine Electric Association Annual Meeting.—The following officers were elected at the annual meeting of the Maine Electrical Association held in Portland, Me., last week: President, Mr. John H. Maxwell, of Livermore Falls; first vice-president, Mr. Fred O. Eaton, of Rumford Falls; second vice-president, Mr. Charles E. Smith, of Newport; secretary-treasurer, Mr. W. S. Wyman, of Augusta. Executive committee, the above with Messrs. Harry B. Ivers, of Portland; Edward R. Graham, of Bangor, and Thomas W. Hawkes, of Rockland. In addition to the business meeting, sails were enjoyed around Portland harbor and an old-fashioned clambake was held at Long Island.

* * *

Missouri Association to Hold Convention on Boat Next Year.—At a recent meeting of the executive committee of the Missouri Electric, Gas, Street Railway and Waterworks Association it was decided to hold the 1914 convention on board a Mississippi River steamboat when en route from St. Louis to Keokuk and return. The convention will take place in May. In addition to arranging for the next convention, the committee proposed plans for increasing the membership of the association. Those in attendance at the meeting were President J. E. Harsh, of Sedalia; Messrs. F. E. Murray, of Louisiana; J. R. Woodfill, Jr., of Aurora; Hugo Wurdack, of St. Louis; H. Spoehrer, of St. Louis, and S. W. Henderson, of Excelsior Springs, of the executive committee, and E. S. Seeley, chairman of the membership committee, and F. D. Beardslee, of St. Louis, secretary-treasurer.

Tacoma's Nisqually River Development

Hydraulic features of a 19,000-kw municipal plant utilizing a 500-ft. fall in the glacier-fed Nisqually River. By R. H. Richards

TACOMA, Wash., has recently placed in operation its own hydroelectric generating station, utilizing a fall of 500 ft. in the Nisqually River at a point 36 miles from the city limits. For some years Tacoma has had municipal electric lighting, but prior to the inauguration of the present station the city purchased its energy from the Seattle-Tacoma Power Company. It was at the local election of 1910 that the citizens of Tacoma voted to build their own public generating plant, and the plans for the Nisqually development were drawn up at that time. Although during the construction of the plant there were three changes in political administration and three different sets of engineers were in charge of operations, the original specifications were carried out to the end.

The new Nisqually station is located at Lagrande, Wash., about 36 miles south of Tacoma, on the Nisqually River. The latter has its source in the Nisqually Glacier on Mt. Rainier, and, since the stream is of this glacial origin, special care had to be taken to remove the sand and silt from the water by an arrangement of settling channels.

The first construction work on the plant was started in 1910 at the headworks about 2 miles above Lagrande. The river takes a precipitous course between this point and the power-house site, undergoing a fall of 500 ft. in the interval.

The Headworks Dam

The headworks dam is a solid concrete structure 225 ft. long, set at right angles to the river and resting on bedrock 20 ft. below the riverbed. It is 40 ft. wide at the base and 5 ft. wide at the top, and stands 35 ft. high. At the north side are two wing-walls keyed into solid rock, and at the south side are the two gatehouses, one leading into the settling channel, the other to a wasteway. These gate houses are of brick construction; each containing two electrically operated 5-ft. by 7-ft. gates.

The settling channel, designed to remove glacial débris, is 1300 ft. long. It is built of solid concrete, the walls on the river side being 6 ft. at the base and 1 ft. at the top. The channel is 25 ft. wide and 14 ft. deep. On the side opposite the river the wall is built against solid rock and is accordingly a mere lining a foot in thickness, top and bottom. The concrete in the floor of the channel is 6 in. thick.

About 25 ft. from the end of the settling channel is located the mouth of the 2-mile tunnel leading to Lagrande. This tunnel entrance is elevated 6 ft. above the base of the settling channel. The end of the settling channel is also closed by a gate house similar to the one at its entrance.

Two-Mile Rock Tunnel

The tunnel is bored through solid rock, and is 10,069 ft. long, 9 ft. wide, and 8.5 ft. high. The roof has been left just as it was after blasting, but the sides are walled with concrete which varies from 8 in. to 24 in. in thickness. The floor is concave in section, with a 6-in. invert at the center. The tunnel follows a tangent with a 2 per cent grade throughout its full length.

Emerging from the tunnel the water is carried across the river in a 10-ft. steel pipe, supported on a steel bridge shown in one of the illustrations. This section of pipe line is 540 ft. long and contains three expansion joints, one at each end of the bridge and one in the center. The river at this point flows 432 ft. below the pipe bridge. Reaching the

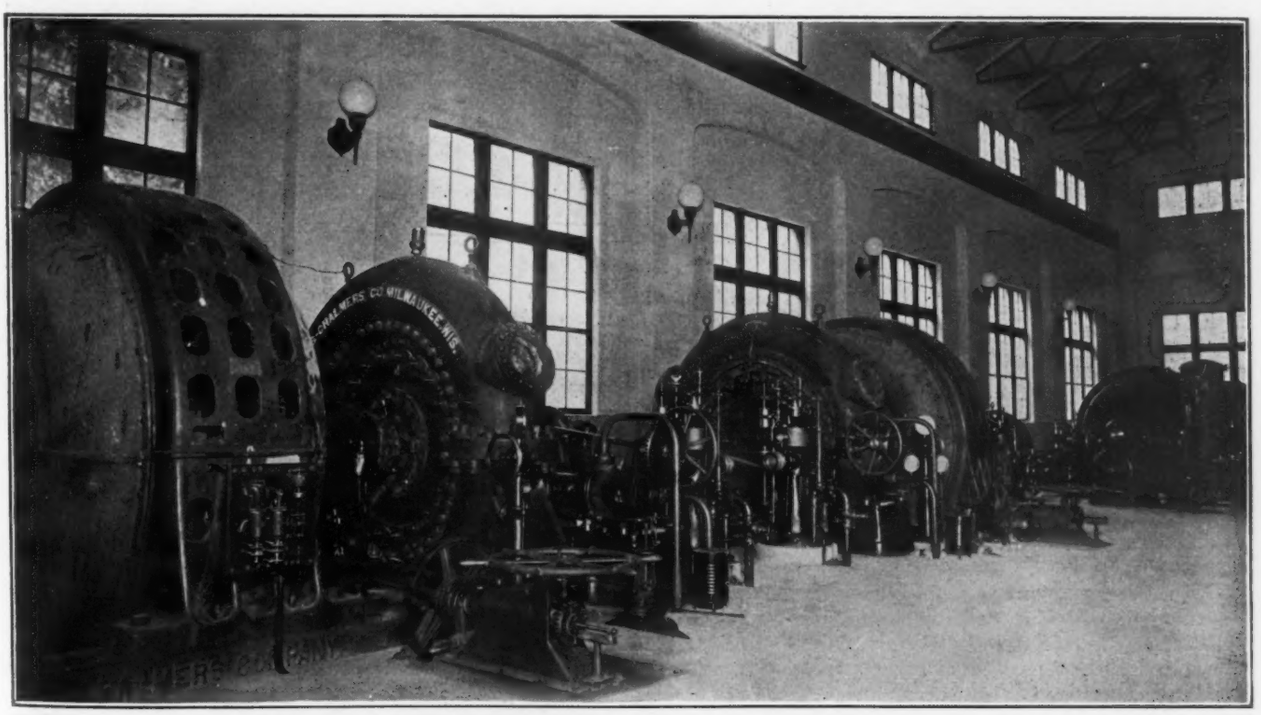


FIG. 1—INTERIOR OF NISQUALLY STATION, SHOWING WATER TURBINES AND ALTERNATORS

further bank, the water again enters a short tunnel for a distance of 1200 ft., and emerges at the by-path channel of the reservoir.

The Reservoir

The reservoir of the Nisqually development is of solid concrete construction and has a storage capacity of 3,200,000 gal. Its massive walls have expansion joints at intervals

FIG. 2—HEADWORKS DAM, SHOWING GATE HOUSES AND ENTRANCE TO TUNNEL

of 30 ft., and the floor is laid in 19-ft. square slabs, 16 in. thick. The 1-in. openings between each slab were filled with oakum and hot pitch, and 6-in. drain tiles have been laid under each joint.

There are three gate houses located around the reservoir. The one at the end of the reservoir channel contains four gates, each 5 ft. by 7 ft. in opening. Two of these gates lead to the spillway and two lead through a tunnel under the reservoir to the main gate house, where the pressure pipes extend over the hill to the power house. Thus it is possible to divert the incoming water directly to the turbines without having it enter the reservoir at all.

FIG. 3—STEEL BRIDGE CARRYING PIPE LINE ACROSS CANYON OF NISQUALLY RIVER

The reservoir channel is divided from the reservoir proper by a 10-ft. weir wall. The gate house at the south end of the reservoir contains the "washout" gates for the reservoir. These two gates measure 5 ft. by 7 ft. and are electrically operated in the same manner as the ones at the headworks.

The four main penstocks are each 72 in. in diameter at the gate house, reducing to 54 in. at the turbine. They vary from 0.26 in. in thickness at the top to 0.75 in. in the lower sections. The exciter pipe is 24 in. in diameter throughout its entire length and has walls 0.625 in. thick.

The pressure pipes are set on a 62 per cent grade, the power house being situated 410 ft. below the reservoir. At 80-ft. intervals the pipes are supported on concrete anchors which extend 2 ft. over the top of the pipes. In addition, however, the first anchors above the power house extend 12 ft. over the pipes, forming a retaining wall to prevent slides of rock from striking the power house. All anchors are set into the native rock and are also keyed into the rock cuts on each side. After the pipes had been tested the pipe ditches were backfilled with earth to the level of the tops of the tubes, the earth being tamped well into place.

At the power house the 24-in. exciter pipe branches into two 16-in. pipes, which are also connected to the main penstocks by 16-in. pipe. The main gate house is fitted with a 24-in. by-path pipe for filling the pressure pipes.

FIG. 4—PENSTOCKS, SHOWING MAIN GATE HOUSE, PRESSURE PIPES AND INCLINE FOR BRINGING IN MACHINERY

Near the entrance to the turbines each of the main pressure pipes is fitted with a 54-in. butterfly valve operable electrically from the switchboard.

Generating Equipment

The main generating equipment consists of four 4750-kva, 6600-volt, 60-cycle, three-phase units running at 450 r.p.m. Each generator is direct-connected to a turbine rated at 8000 hp. Both turbines and generators were furnished by the Allis-Chalmers Company, as was also the exciter equipment. The latter consists of two Doble water-wheels, each direct-connected to a 300-kw, 125-volt direct-current generator operating at 400 r.p.m.

Both the turbines and the water-wheels are controlled by Allis-Chalmers oil-pressure governors. The turbines are also fitted with 24-in. Allis-Chalmers relief valves. The draft tubes of the main units are built of steel, while those of the exciters are of concrete. The generator room of the power house is provided with a 35-ton crane. During construction of the plant, all the machinery had to be lowered

down an inclined track set at 68 per cent grade. The heaviest parts handled were the revolving fields, each of which weighed 37 tons.

The switchboard and switching equipment were furnished by the Westinghouse Electric & Manufacturing Company. The switchboard is of blue Vermont marble and all switches are of the remote-control type. The structure

FIG. 5—RESERVOIR OF NISQUALLY POWER PLANT

for the 6600-volt bus is built of pressed-brick. Both the 6600-volt bus and the 60,000-volt bus are sectionalized at the center by tie-switches. A Tirrill regulator is connected to each side of the 6600-volt bus, but all generator field rheostats are of the hand-operated type.

The transformers are located in a separate room at an elevation 35 ft. above the generator floor. These units are of the water-cooled, oil-insulated type and were furnished by the General Electric Company. The installation comprises twelve single-phase units, each stepping from 6600 volts to 60,000 volts, with delta-connected windings on both the high-tension and the low-tension side.

The transformers are equipped with a duplicate water system and the oil piping is so arranged that any transformer can be drained to a large storage tank. There are also separate pipes provided for filling each transformer. The transformer room is served by means of a 15-ton electric crane.

Two high-tension circuits extend from the power house to the substations and the bus system is so laid out that each pair of generators can be run as a single unit feeding to one line. One exciter is capable of exciting all four generators. The switchboard indicating instruments are of the round-dial type.

Exciter and field switches are solenoid-operated, and are fitted with carbon breaks. Both the 6600-volt cables and the exciter cables in the station are lead-covered and are carried in fiber conduit. All lighting circuits are run in steel conduits, the same construction also applying to all in-

FIG. 7—HIGH-TENSION ROOM; 60,000-VOLT OIL SWITCHES

strument and control wires. The power-house building is lighted by flaming-arc lamps and tungsten clusters.

TRANSMISSION LINE

The transmission line is 28.2 miles long and is operated at 60,000 volts. It is carried on 45-ft. cedar poles, placed forty to the mile. Transpositions are inserted at intervals of one-third of a mile.

The line conductor used is 250,000 circ. mil in cross-section. The telephone wire is of No. 10 iron and is carried on wood brackets. The two transmission lines run on separate poles for one-half the distance, the two circuits being mounted on a single pole for the remainder of the length of the line.

The substation contains transformer and switching equipment generally similar in all respects to that already described for the power house.

The total cost of Tacoma's Nisqually development was $2,125,000.

Mr. Frank C. Kelsey prepared the plans for the Nisqually plant, and during its construction the author acted as electrical engineer, being employed by the city of Tacoma.

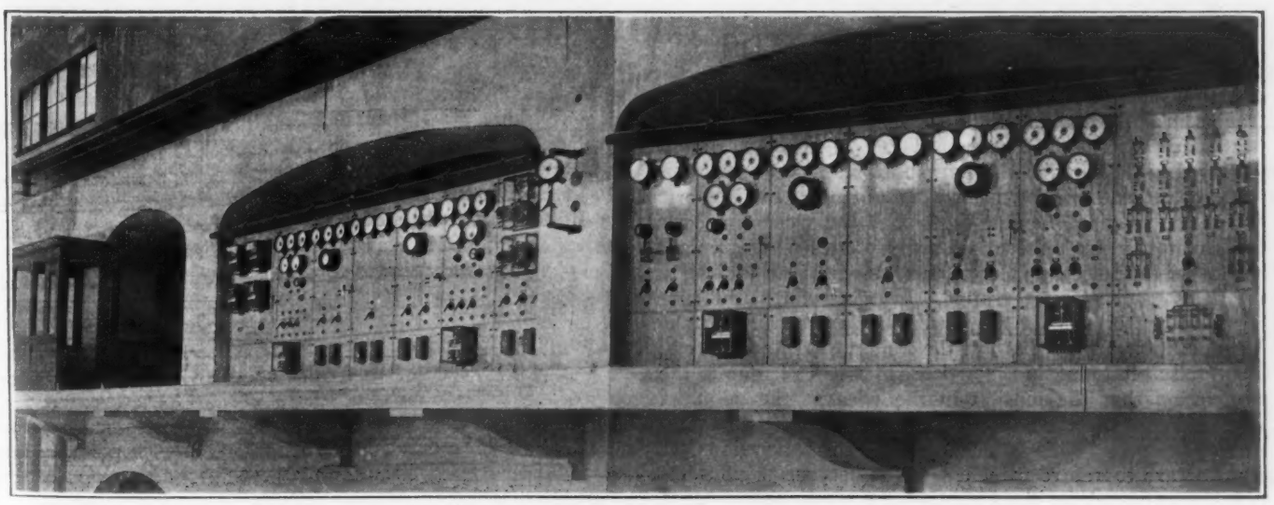


FIG. 6—SWITCHBOARD BALCONY IN GENERATING ROOM

Graphical Statics Applied to Transmission-Line Calculations

By Alfred Still

It is usual to assume that the form taken by wires stretched between two points and subject to the influence of gravity is either a parabola or a catenary. For nearly all practical purposes either assumption leads to sufficiently accurate results. The first is based on the supposition that

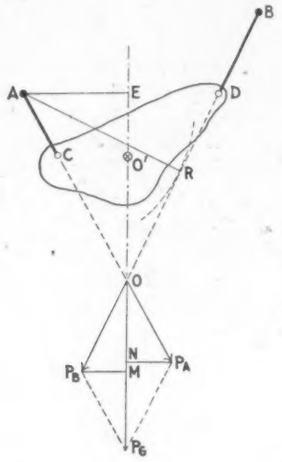


FIG. 1—FORCE DIAGRAM—SUSPENDED MASS

the total weight of the wire is distributed uniformly over the horizontal distance between the two supports, which would give the shape of curve followed by the cables of a suspension bridge. The catenary is the curve of a perfectly flexible homogeneous material of uniform cross-section hanging between two suspension points under the influence of its own weight only.

The use of formulas based on either of these curves is liable to obscure the real nature of the problems to be solved and lead to somewhat hazy notions regarding the component forces and their resultants. It is not suggested that a departure from the usual methods of calculation is necessary or desirable, and what follows is written more for the purpose of obtaining a clear conception of the forces in the wires and at the points of support than to develop new formulas or put forward anything essentially original on the subject.

Many students and practical engineers appear to have trouble in understanding the distribution of forces in overhead lines carried up a steep grade. An unsigned article appeared in the London *Electrical Review* of Aug. 18, 1911, in which an attempt was made to show that, if the supports are of the so-called flexible type, or if the suspension type of insulator is used, there is a transference of the weight of the wires from the poles at the bottom of an incline to the poles on the higher ground. In other words, the supports on the hillside at the lower levels are said to take less than their proper share of the weight of the conductors. The faulty reasoning in the article referred to is due to the assumption that the tension in the wire at the point of support is the same on the up-hill side as on the down-hill side of the pole. This is incorrect, and the conclusions arrived at are therefore valueless. It is because trouble has been experienced on lines carried up steep inclines that theories of this kind are advanced, and the idea that the poles on a steep grade carry increased loads as they occupy positions higher up the hillside appears to be shared by many. As a matter of fact, the troubles referred to have been caused by want of care in erecting the line or want of knowledge on the part of the designer, with the result that the maximum tensions in the conductors have been greater than where the line runs over level country. In the present article particular attention has been given to the calculation of stresses in lines carried up steep grades.

Although at the outset no reference is made to the shape of the curve taken up by the wires, it may be well to conclude these preliminary remarks by pointing out that the one disputable assumption made, namely, that the weight is uniformly distributed over the straight distance between points of support, is virtually equivalent to assuming the parabolic form. It follows that the formulas derived should be equivalent to those commonly used for the solution of sag-span problems.

General Problem

Consider a mass of any irregular shape, the weight of which may be represented by the vertical vector OP_g passing through its center of gravity O' as shown in Fig. 1. This mass is suspended by two perfectly flexible ties from the fixed points A and B. Except for the special case of parallel forces, the resultant P_g and the components P_a and P_b, acting in the direction of the suspension cords AC and BD will pass through the common point O. The system of forces is in equilibrium and the conditions to be fulfilled are therefore, first, that the vectorial sum of all external forces and reactions shall be zero and, second, that the sum of all moments taken about any point shall be zero.

The following is an explanation of the manner in which a force diagram similar to Fig. 1 may be constructed.

Known Data:

(1) The position of suspension points A and B.

(2) The magnitude and position, relatively to points A and B, of the force of gravity (that is, the length of the vector OP_g and the distance AE of this vector from the point A).

(3) The magnitude, but not the direction, of the force P_b acting through the suspension point B.

Required:

(1) The direction of the force P_b.

(2) The magnitude and direction of the force P_a.

(3) The horizontal and vertical components of the stresses at the points of support.

Taking moments about the point A gives the equation

$$P_b \times AR = P_g \times AE$$

thus

$$AR = AE \times \frac{P_g}{P_b}$$

From the point A as a center, use this radius to draw an arc of circle the tangent to which, passing through the point B, will locate the point O. Draw OP_g to the proper scale to represent the force of gravity and complete the parallelogram of forces. The vertical component of the reaction at point A is NO, and at the point B it is MO. The horizontal reactions at the points of support are P_aN and P_bM respectively. These are obviously equal, but opposite in direction, in every conceivable case of a body in

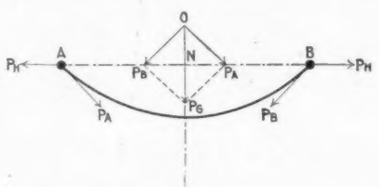


FIG. 2—FORCE DIAGRAM—HORIZONTAL SPAN

equilibrium subject only to the force of gravity acting, as it always does, vertically downward.

Stretched Wire—Supports on Same Level

In Fig. 2 a wire weighing W lb. per foot is stretched between the supports A and B lying in the same horizontal plane. The maximum tension in the wire is P_b lb. This is the tension at the points of support, and, owing to the symmetry of the figure, it is the same in amount at A as

at B. The assumption is now made that the total weight of wire is equal to the weight per foot multiplied by the straight-line distance between the points A and B. Thus

$$P_g = W \times l$$

where l is the distance in feet between A and B. This assumption is allowable on all except spans of extraordinary length, because the actual length of the wire differs only by a very small amount from the shortest distance between the points of suspension.

Draw the vector OP_g to represent the total downward force Wl. It will lie on a vertical line midway between A and B. Let it be bisected by any horizontal line such as AB. From O lay off OP_b at such an angle that the head P_b of the vector lies on the horizontal line bisecting OP_g. Complete the parallelogram of forces. Then ON represents the vertical component at each point of support, and NP_b or NP_a is the horizontal force P_h acting at each support; it is also the total tension in the wire at the center or lowest point of the span.

Calculation of Sag

Referring to Fig. 3, which shows a span of length l, it is required to calculate the sag s at the center. Consider the moments about the point A due to the half span AD. These must balance, and the equation is

$$s \times P_h = \frac{l}{4} \times \frac{Wl}{2}$$

or

$$S = \frac{Wl^2}{8P_b}, \qquad (1)$$

which is the well-known formula for sag calculations when the parabolic assumption is made.

Supports at Different Elevations

In Fig. 4 the difference in elevation between supports is h feet. The span measured horizontally is l feet, and the angle α which the straight line AB makes with the horizontal is

$$\tan^{-1}\left(\frac{h}{l}\right).$$

The actual length of the direct line between points of support is $l' = \frac{l}{\cos \alpha}$. The weight of wire per foot is W lb., and it is assumed that the total weight is Wl' lb. This force acts through the point C midway between A and B. The other known quantity is the magnitude (but not the direction) of the maximum tension in the wire; this is the force P_b acting through the highest point of support (B).

Draw the vertical line OP_g to represent the total force of gravity (Wl'). Through its center C draw the line AB (or a line parallel to AB) making an angle α with the horizontal. Then from O as a center describe an arc of radius OP_b equal to the known force P_b. Its intersection with AC locates the head of the vector OP_b. Complete the parallelogram of forces, and drop the perpendiculars P_aM and P_bN on to the vertical OP_g. These last are a measure

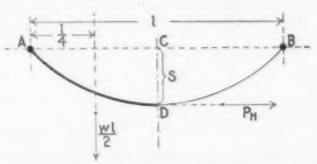


FIG. 3—DIAGRAM FOR SAG CALCULATION

of the (equal) horizontal components of the reactions at the two points of support and also of the total tension in the wire at the lowest point D. The length MO is the vertical component of the reaction at the lower support A, while NO is the vertical reaction at B. Their sum is, of course, equal to OP_g. The angle β which the vector P_b makes with the horizontal is the slope of the wire where it leaves the point B.

The construction as above described satisfies the fundamental conditions of equilibrium, namely, that all vertical forces shall balance, that all horizontal forces shall balance, and that the sum of all moments taken about any point shall be equal to zero.

In practice it is not convenient to solve such problems by actual measurement of quantities plotted to scale on drawing paper, because the horizontal components of the forces

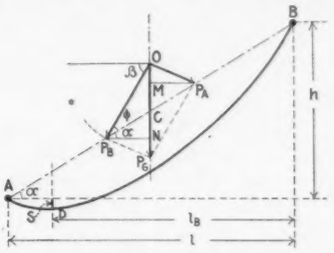


FIG. 4—FORCE DIAGRAM WITH SUPPORTS AT DIFFERENT ELEVATIONS

are usually very much greater than the vertical components. A trigonometrical solution is therefore desirable.

In Fig. 4 the known quantities are the two sides OP_b and OC of the triangle OCP_b, of which the angle OCP_b is also known, being equal to $\alpha + 90$ deg.

The angle OP_bC or φ may be calculated from the relation

$$\sin \varphi = \frac{OC}{P_b} \sin (90 + \alpha)$$

$$= \frac{Wl'}{2P_b} \cos \alpha \qquad = \frac{Wl}{2P_b}$$

and the angle β which the wire at the upper support makes with the horizontal is, therefore,

$$\beta = \alpha + \sin^{-1}\left(\frac{Wl}{2P_b}\right) \qquad (2)$$

With the aid of trigonometrical tables or a slide rule the values of sin β and cos β can be obtained and the other components of the force diagram readily calculated. Thus, the horizontal component at either point of support, which is also the total tension in the wire at the point (if any) where the slope is zero, is

$$P_h = P_b \cos \beta \qquad (3)$$

The vertical component of the reaction at the highest point B, where this reaction is greatest, is

$$P_{bv} = NO = P_b \sin \beta \qquad (4)$$

The weight supported by the lower pole is

$$P_{av} = MO = Wl' - P_{bv} \qquad (5)$$

This may, obviously, be a negative quantity; that is, the wire may exert an upward pull on the lower support. In that case the sag s below the point A will be zero, and this would correspond to the usual condition on a steep incline or on a moderate incline if the spans are short.

Position of Lowest Point of Span—Supports at Different Elevations

The position of the lowest point D in the span will be determined by the vertical weights carried by each of the two supports. Thus, referring to Fig. 4, the vertical component of the forces acting at B is simply the weight of that portion of the wire comprised between the support B and the point D where the tension in the wire has no vertical component. Thus the horizontal distance of the point D from B (in feet) is

$$l_b = l \times \frac{ON}{OP_g}$$

$$= \frac{lP_{bv}}{Wl'} \qquad = \frac{P_{bv} \cos \alpha}{W} \qquad (6)$$

This may give a distance for l_b which is greater than l. In that case the support A would be the lowest point in the span. It may be observed that if the formula (4) gives a value for P_{bv} greater than the total weight of the span

(Wl') it is unnecessary to proceed with the location of the point D, since the resultant force at A must be in an upward direction.

Calculation of Sag with Supports on an Incline

The formula (1) as calculated for spans with supports on the same level may be used for spans on an incline provided the distance l_b of Fig. 4 is considered as half of a level span of which the sag is $(h+s)$. Thus,

$$(s+h) = \frac{W}{\cos\alpha} \times \frac{4 l_b^2}{8 P_h} = \frac{W l_b^2}{2 P_h \cos\alpha} \qquad (7)$$

On a steep incline, where A is the lowest point of the span, it is more useful to know the maximum deflection of the wire from the straight line AB as observed by sighting between the points A and B. This maximum deflection will be at the center of the span, the assumption in regard to load distribution being as previously made. A study of the force diagram in Fig. 4 will make it clear that, just as OP_b is the slope of the tangent to the wire at the point B, and P_bN is the slope of the tangent to the wire at the lowest point D, so P_bC is the slope of the tangent to the curve at the middle of the span. This is therefore the point of maximum deflection from the straight line AB.

Consider now Fig. 5. The maximum deflection of the line on the slope is s', and, by taking the sum of all the

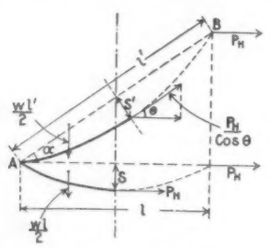


FIG. 5—DIAGRAM FOR SAG CALCULATIONS WITH SUPPORTS AT DIFFERENT LEVELS

moments about A and putting this sum equal to zero, the value of this deflection is found to be

$$S' = \left(\frac{Wl'}{2} \times \frac{l}{4}\right) \times \frac{\cos\alpha}{P_h} = \frac{Wl^2}{8 P_h} \qquad (8)$$

which indicates that the maximum deflection from the straight line of a conductor strung between supports on a slope, as measured at the center of the span, is exactly the same as the maximum sag, s, of the same conductor strung between points on the same level, provided the span measured horizontally and the horizontal component (P_h) of the tension are the same in both cases.

Example Illustrating Use of Formulas

Consider a span of 485 ft. measured horizontally, with a difference of level of 40 ft. between points of support. The wire is of No. 2-0 B. & S. gage aluminum, weighing 647 lb. per mile. The problem is to calculate the sag and vertical and horizontal components of the forces when the maximum tension in the wire is 185 lb.

The known quantities are:

$$l = 485;\ h = 40;\ W = 0.1226;\ P_b = 185$$

The unknown quantities are calculated as follows:

$$\tan\alpha = \frac{40}{485} = 0.0825$$

$$\alpha = 4 \text{ deg. } 43 \text{ min.}$$

$$\cos\alpha = 0.9966$$

$$\sin\varphi = \frac{485 \times 0.1226}{2 \times 185} = 0.161$$

$$\varphi = 9 \text{ deg. } 15 \text{ min.}$$

By formula (2) $\beta = \alpha + \varphi = 13$ deg. 58 min.

$$\cos\beta = 0.971$$

$$\sin\beta = 0.2413$$

By formula (3) $P_h = 185 \times 0.971 = 180$ lb.

By formula (4) $P_{bv} = 185 \times 0.2413 = 44.6$ lb.

By formula (6) $l_b = \frac{44.6 \times 0.9966}{0.1226} = 364$ ft.

By formula (7) $(s+h) = \frac{0.1226 \times (364)^2}{2 \times 180 \times 0.9966} = 45.2$ ft.

Thus the sag below the bottom support will be 5.2 ft. when the maximum tension is 185 lb.

Overhead Lines on Steep Grade

Except for the fact that the pole foundations must be wisely chosen and special attention paid to the setting of the poles, there are no engineering difficulties in the way of running an overhead line up a steep incline. It may be well to reduce the length of span measured horizontally so that this is equal to about $l' \cos\alpha$, where l' is the distance between supports on level ground and α is the angle which the average slope of the line makes with the horizontal. This will insure that the vertical load to be supported by the insulators does not exceed the vertical load on the level runs, but no difficulty need be experienced in providing that each pole shall take its proper share of the weight of the wire (with or without ice loading).

The stringing of the wires may be done with the aid of a dynamometer, or the sag, as calculated by formula (8), can be measured by sighting from pole to pole. If the poles or suspension insulators of a line carried on an incline are deflected from the vertical owing to the unbalancing of horizontal forces at the time when the wires are strung, the effect must be attributed to incompetence on the part of the engineer in charge of construction and not to any unexplained flaw in the known laws of equilibrium. If the conductor is tied to the insulator at the proper point, the horizontal components of the forces at this point will balance.

Concluding Sessions of Ohio Convention

An account of the first two sessions of the Ohio Electric Light Association convention, held at Cedar Point, Ohio, July 15 to 18, appeared in these columns on July 19. The session of Thursday morning, July 17, was opened with the discussion of the paper on "Means of Developing and Diversifying the Present Load," by Mr. H. E. Armstrong, East Liverpool, Ohio.

Developing and Diversifying Present Load

In his paper Mr. Armstrong described results obtained during two years' commercial work at Steubenville, Ohio, during which time the motor load has increased from 40 hp to 1500 hp, despite the isolated-plant competition afforded by natural gas at 15 to 25 cents per 1000 cu. ft. Many power users were, however, greatly surprised when their attention was called to the many miscellaneous items such as labor, repairs, auxiliaries, supplies, etc., for which they were paying in addition to their fuel costs. Flat-rate controllers were also employed with success to get residence business. In the July 19 issue there was given an enumeration of the results obtained at Steubenville, showing the increase in connected load from 684.5 kw in 1911 to 2775 kw in 1913 as the result of the commercial campaign. The central station, declared the author, should do all in its power to teach its customers that it is not a soulless corporation but a friend willing at all times to meet them more than half way in all disputes. It should also impress on their minds that the proper place to make a kick—when they have one—is at the company's office and not to their next-door neighbors.

Discussion

In opening the discussion Mr. D. L. Gaskill, Greenville, emphasized sign lighting as a means of diversifying the load. Following this suggestion Mr. E. A. Elliott, Mt. Vernon, read a short paper on the possibilities of electric signs as revenue producers. Not only do electric signs increase the income, but they sometimes induce promoters of industrial enterprises to locate in the cities and towns thus lighted, as the signs show the progressive attitude of the locality. Mr. Elliott particularly urged the installation of electric signs near railway stations, where they can advertise points of particular interest in the town. Mr. T. F. Kelley, Dayton, said that where central stations can obtain the co-operation of electric sign companies a successful campaign can generally be realized. Mr. W. C. Anderson, Canton, foresaw great possibilities in the electric soldering iron if the price can be reduced. Mr. J. C. Martin, the president of the association, closed the discussion by saying that a diversified output can be obtained by meeting the demands of the public for electrically operated apparatus.

Business matters left over from the preceding day were next taken up. Mr. Martin appointed the members of the committee on new business, which will conduct a sort of clearing house for new ideas on how to get business. The amendment to the constitution, allowing electrical engineers and instructors in electrical science to become engineering members of the association, was also adopted.

Resolutions recommending the publication of a monthly bulletin and the assessment of active member companies' dues were approved. A committee of five was also appointed to investigate the subject of changing associate members' dues.

THE HUMAN EQUATION

Mr. S. G. McMeen, president of the Columbus Railway & Light Company, delivered an interesting address on "The Human Equation." He spoke of the relative abilities of the technically trained man and the practical man to adapt themselves to circumstances which require prompt action. Mr. McMeen also spoke of the general opinion which newspapers have created in the public mind concerning public-utility corporations, and said that he believed the average corporation tries to do right to a greater extent than does the average public. If the human equation was understood more fully, he believed it would bring the public and the corporations into better accord.

As a consolation to those believing that legislation would soon be so exacting as to overwhelm the most conscientiously conducted corporations, Mr. McMeen said that belief on the part of the corporations' representatives in the purposes which they foster, coupled with enthusiasm, cannot help but bring satisfactory results. He urged his audience not to object to regulation by commissions, as it will eventually prove satisfactory when those bodies have obtained sufficient experience. Commissions have to deal with two parties—the public and the corporation—and to have equitable conditions both must be consulted. City council regulation is inefficient in that the average councilman is not well enough informed on engineering details to know what is satisfactory to the public which he represents, and his tenure of office is not sufficient for him to become acquainted with such facts.

In closing Mr. McMeen said that although large organizations apply scientific management to their business, the individuals connected therewith seldom apply it to their own minds.

REPORT OF METER COMMITTEE

The meter committee, composed of Messrs. A. H. Bryant, chairman, Cleveland; C. B. Stelle, Springfield; John Himes, Dayton, and F. C. Jeannot, Marysville, in submitting its report called attention to the success of its metermen's conferences held at different points throughout the State during the past year. Three districts were arranged, and division meetings were attended by as many as twenty metermen from nearby member and non-member companies. The result aimed at has been the furtherance of mutual acquaintanceships, stimulation of wider interest and the fostering of a co-operative spirit among the metermen of the State. The committee has also received a number of answers to its letters soliciting suggestions concerning ways in which the committee may increase its own usefulness. Printed with the report were short papers by Mr. F. C. Jeannot, Marysville, on "The Importance of Maintaining Meters Within Commercial Accuracy," and Mr. C. B. Stelle, Springfield, on "Methods of Meter Testing," both of which were presented at the metermen's conferences earlier in the year.

Discussion

To bring out a systematic discussion of the committee's report President Martin called on Messrs. W. Parsons, of Springfield; W. S. Culver, of Cincinnati, and John Himes, of Dayton, to read written discussions.

Mr. Parsons presented some interesting figures showing the cost of periodic meter tests in Springfield, and also gave results showing the accuracy of the meters tested. From these figures the increase in revenue due to the correction of slow meters was computed. The confidence of public-utility commissions and the increased satisfaction on the part of the public due to periodic tests were emphasized.

Mr. Culver's paper dealt with the selection, maintenance and operation of different meters. He brought out the severe conditions under which electric meters have to operate, in comparison with water, gas and steam meters, and discussed the relative accuracy of the different types.

Mr. Himes read an interesting paper on the "Reclamation of Flood-Damaged Meters in Dayton," where about 75 per cent of the meters installed had to be rehabilitated. A description of this work was given in the *Electrical World*, June 14, 1913.

Mr. J. T. Kermode, Cleveland, urged periodic testing of meters and the co-operation of the smaller Ohio central stations with the committee. As evidence of the need of small companies for the committee's advice, he told of direct-current meters being used on an alternating-current system in one small Ohio town.

Mr. Gaskill closed the discussion by commending the committee for bringing the subject to the central stations in person through its meetings in the State, and suggested that a standing committee on illumination be appointed.

COMMITTEE ON ELECTRICAL TRANSMISSION

The report of the committee on electrical transmission, of which Mr. M. H. Wagner served as chairman, was confined to a discussion of lightning-arrester problems and overhead-crossing construction. Following an elementary explanation of lightning phenomena, the report passed to a description of forms of arresters, including the multi-gap, open-air horn-gap, electrolytic and compression types. Particular stress was laid upon proper grounding, by pipes being driven into salted earth where necessary. Among new forms of overhead high-tension crossings in use in Ohio, the Dayton company employs an additional loop at each span insulator, carried on an upper insulator which is brought into play to support the crossing span only if the other insulators break. In another form 5-ft. jumpers are soldered to the span wire, while threaded through the loops thus formed is passed a second wire of equal cross-section with the main cable. The report closes with extracts from the Ohio state laws on right-of-way matters, making it clear that electric-lighting companies have eminent domain to secure rights-of-way for their lines, both inside and outside of municipalities, although in the former case the consent of the municipality must first be secured. It has also been repeatedly held by the courts that the erecting of a transmission line is an additional use to what was intended

for the highway, and the right of the abutting property owner for compensation and damages for such additional use has been always upheld. In proceedings to appropriate a right-of-way, the question is one to be determined by the jury as to the amount to which the property owner is entitled for the additional use.

Discussion

Following Mr. Wagner's abstract of the report, Messrs. D. L. Gaskill, Greenville; W. Parsons, Springfield; W. S. Culver, Cincinnati; J. C. Martin, Wilmington, and Prof. F. C. Caldwell, Columbus, took part in the discussion. Mr. Gaskill said that in Ohio there is a fundamental law granting all electric-service companies the right to construct lines on county and state roads as long as they do not interfere with existing lines. A prosecuting attorney in Montgomery County has told Mr. Gaskill that while it would be better for electric-service companies to get permission for erection of lines along highways from the commissioner having the highway under supervision, such procedure is not necessary.

Mr. Parsons spoke in favor of compression-type lightning arresters, saying that these devices are used to protect each transformer installation in Springfield.

Mr. Culver said that it is practically impossible to protect lines against direct lightning strokes, but added that a ground wire grounded at each post is effective in avoiding bad results from such strokes. He brought out the practicability of different types of lightning arresters by quoting the number of strokes which an artificial line equipped with various arresters withstood before serious results occurred.

Professor Caldwell suggested that it would be desirable to send out inquiries to the member companies in the State, requesting information on their experience with lightning. Professor Caldwell also spoke briefly of a case in which line surges noticed in Columbus had been attributed to switching. Subsequent experiments with an oscillograph showed this hypothesis untrue. He advised investigating such cases.

In closing he told of a method of securing a good ground connection in earth which does not receive much moisture. Mr. Wagner said that it has been found that rust accumulating on a ground-plate does not reduce the effectiveness of such a ground, because a rush of current has reached its destination when it arrives at the ground-plate and will be discharged under any condition.

Standing committees on illumination and electric haulage were appointed, and Mr. Gaskill advised that the insurance committee investigate the subject of inter-insurance and report to members through the monthly bulletin.

FRANCHISES

The address on "Franchises" delivered by Mr. James V. Oxtoby, counsel for the Edison Illuminating Company of Detroit, Mich., was deemed of such value by the members that a motion was made and passed to have the entire address published in the *Bulletin*.

Mr. Oxtoby discussed term franchises as to their effect on rates and depreciation charges and on property rights at the expiration of the franchise. In addition he brought out the possibility of rates fixed by franchise being subject to regulation by state commissions. It was the original idea to have franchises expire at a definite time in order that rates and extensions might be adjusted, but with the present regulation Mr. Oxtoby said that placing the property of a company in jeopardy at the expiration of a franchise is wrong. Public-utility corporations are generally at a disadvantage at the expiration of a franchise in not being on an equal footing with the public.

To meet the situation at the expiration of such a term franchise he cited the method used by the Cataract Power & Conduit Company, of Buffalo, as the best solution at present. If a term franchise is held, depreciation and rates should be fixed as though the business ceased at the expiration, and charges should be included for removing service from the streets at that time. Wherever the maximum term of franchises is stipulated in a state constitution Mr. Oxtoby expressed belief that this is a step backward in civilization. If the public realized that term franchises mean higher rates the subject would not be urged.

Cleveland's charter would be ideal, said Mr. Oxtoby, if provision was made for termination of franchises on valuation. If there was a general law for framing franchises and permitting municipalities to fill out merely the details, conditions would be more satisfactory. Indeterminate permits are the best provisions up to the present time.

Cases were cited in which states had repealed franchises and regulated rates granted by local bodies. The possibility of such procedure in Ohio was shown by reading a clause from the state constitution. In closing Mr. Oxtoby said that a franchise merely safeguards an investment and gives no added value to the property.

ILLUMINATION AS A COMMERCIAL PRODUCT

Passing from a brief sketch of the history and physics of light, Mr. A. M. Seeger, Toledo Railways & Light Company, divided commercial illumination into the three classes of domestic, business and public lighting. The first-mentioned for convenience may be considered under the headings of general and specific illumination, although in neither class is the problem so much one of engineering as of artistic application. A number of modern, highly efficient systems of public lighting are now available for street lighting, while each class of business presents its own illumination problems. The central station can sell only energy—it cannot sell illumination any more than the merchant can sell satisfaction—so that at best a choice must be made of the best illuminant available at the price the customer wishes to pay, and under such conditions the work of the illuminating company will be most successful.

On account of the prolonged session Mr. Seeger's paper was not discussed.

Throughout the convention the sessions were held during only half the day, the remainder being devoted to entertainments of various sorts for all present. About 625, including members and guests, were registered at the convention, and 412 attended the banquet given at the Breakers Hotel. The latter was followed by vaudeville skits carried out by members of the association. A Jovian rejuvenation was held during the convention, the degree team being in charge of Statesman M. H. Moffett, Cleveland.

150,000-Volt Air-Break Switches for Southern Sierras Transmission System

Of special interest among recent hydroelectric developments is that of the Southern Sierras Power Company in California, whose transmission lines will be operated at 150,000 volts. This will be not only the highest voltage in commercial use, but the line itself is the longest direct transmission line in the world, having a length of 238 miles. The line will transmit energy from Bishop, Cal., to San Bernardino, Cal.

The power is generated by several hydroelectric plants in Nevada and California. The transmission line consists of a double circuit of steel-core aluminum cable. Apparatus for the control of the transmission system is of a radical type, including two 150,000-volt circuit-breakers at each end of the line. This apparatus was furnished by the Bowie Switch Company, San Francisco, Cal.

At the upper end of the line the circuit-breakers are pneumatically operated for synchronizing on the high-tension side. Each pneumatic operating mechanism consists of two cylinders, the piston rods of which are provided on their outer ends with clevises. A slotted cross-bar connecting the two clevises carries at its center a pivot which

connects it in turn to a movable guided bar. This bar carries a rack which meshes with a pinion mounted on the operating shaft.

As the distance from the switchboard to the circuit-breaker is small, direct air control is provided for the breaker. This control mechanism is mounted directly on the switchboard, and consists of a special valve provided

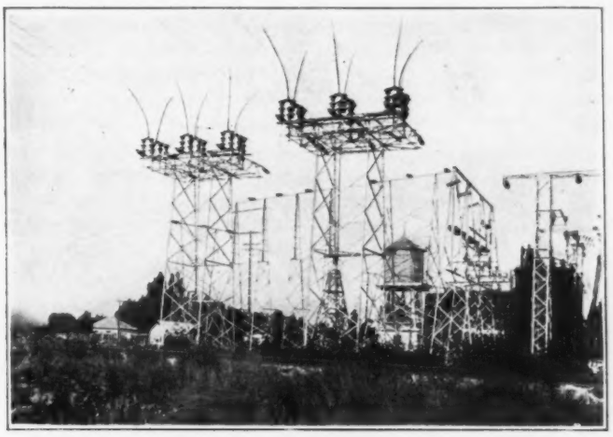


FIG. 1—150,000-VOLT AIR-BREAK SWITCHES AT SAN BERNARDINO SUBSTATION

with two-point position for closure, the opening being accomplished in a single stroke. For closure the operating handle is first thrown to the center position, where it stops automatically. This operates one of the pneumatic cylinders and throws the circuit-breaker to mid position. There are three signal lamps on the switchboard, for the closed, open, and mid positions, respectively. When the mechanism is moved to mid position the corresponding lamp is lighted. The operator may then close the breaker at the proper moment. To accomplish the final stroke of closure, the button in the operating handle is first depressed, and the action of closure is instantaneous.

For opening the breaker only a single motion of the handle is required. The small inertia of the moving parts of these breakers results in practical absence of mechanical jar on operation, and the synchronizing of the line on the

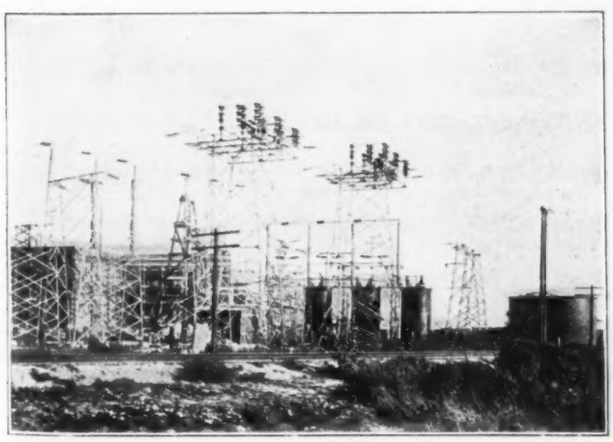


FIG. 2—12,000-KVA OUTDOOR SUBSTATION, SHOWING SWITCHES AND TRANSFORMERS

high-tension side cuts out a large number of complications.

At the San Bernardino end of the line there are two motor-operated type L circuit-breakers, the mechanism for which is mounted on a concrete pier at the base of the tower supporting the breaker. Through worm gearing the motor actuates a vertical shaft, on the lower end of which is a pinion which meshes with a gear loosely mounted on the main shaft. This gear is in turn held in mesh by a jaw clutch which operates on a sliding feather, its position being governed by the operating handle. When this handle hangs vertically downward the jaw clutch is in mesh, thus connecting the electric operating mechanism. With the handle raised to a horizontal position the motor is cut out, allowing instantaneous operation by hand. This is a valuable feature since the handle is always attached and is available for instantaneous operation by hand if desired.

The mechanism includes an electrically operated clutch for the motor, which is controlled by a coil in series with the armature. When the circuit is broken by the limit switches the armature is immediately disengaged, thus preventing the momentum of the motor from causing overtravel of the mechanism. In the control box are located the signal-lamp switches and the limit switches, the latter being governed by a cam mounted on the main shaft. The motor is protected by a sheet-metal cover which keeps off moisture and dirt, and the control box is provided with a removable cover which slides on a lip allowing ready removal and avoiding the use of gaskets.

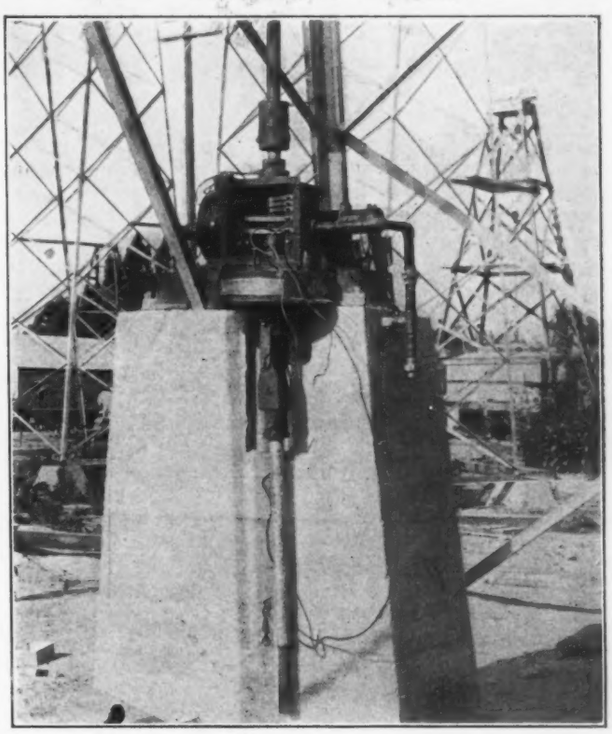


FIG. 3—MOTOR-OPERATING MECHANISM FOR AIR SWITCH

The construction of these circuit-breakers is of interest not only for their electrical design but for the substantial mechanical construction employed as well. They are of the double-break type, each pole comprising two pairs of horns in series. The contacts for the circuit-breaker are mounted adjacent to the horn bases, each pair of horns being bridged respectively by the switch blades. These blades are pivoted at the hinge end and operate in a vertical plane. The contact at the outer end of the blade is made with a clip, and on the extreme outer end of the blade there is a follower contact which is the last to break connection with a corresponding flexible follower on the clip cap, thus protecting the main contacts from burning. The hinge contact is taken through a flexible pigtail connection. As the blade is rotated in a vertical plane, it starts the arc upwards in a direction in which it must travel. After the blade end has passed the horns, the arc is in turn transferred to them and rises and blows itself out promptly. The horns are constructed of galvanized steel which exerts a powerful magnetic action on the arc, in addition to that

caused by the heat of the ascending gases. As the arc lengthens it introduces a high resistance into the circuit, thus cutting down the current value before the final break. This is of importance in the practical operation of the breakers since the current at the instant of the final break is greatly reduced owing to the high resistance of the arc and hence does not set up pressure oscillations.

FIG. 4—150,000-VOLT AIR-BREAK SWITCH, BLADES OPEN

Each pole of the breaker is actuated by a single operating insulator which moves both blades of the pole simultaneously. This insulator rotates around a vertical axis and carries at its top a cap provided with two pins for attachment of the links connecting the blades. At the top the operating insulator is carried by a bronze pivot supported in turn by a bearing mounted on a trussed-steel framework which connects the two hinge caps. This results in an exceedingly strong structure in which all operating strains are practically self-contained. The linkage arrangement is

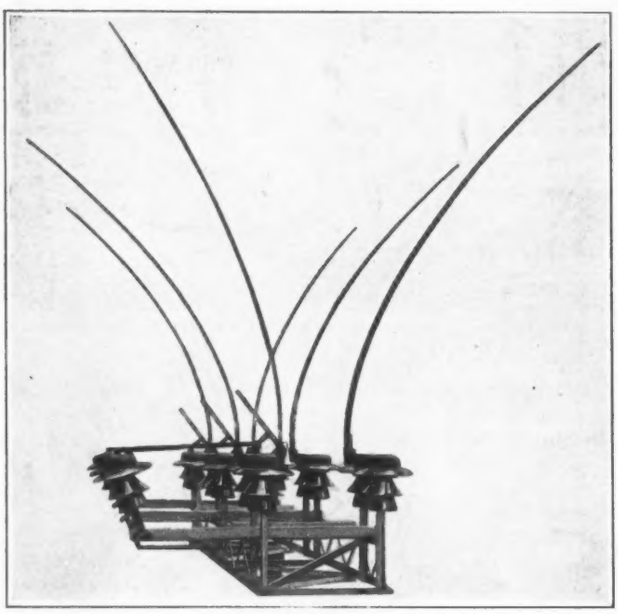


FIG. 5—60,000-VOLT, 100-AMP SWITCH FOR DISTRIBUTION LINES

such that when the blades are closed the pins in the operating insulator are substantially in line with the axis of the insulator and the switch-blade pivot, thus resulting in powerful toggle action at the starting of the blade from the clips when the maximum power is required. This cuts down torsional strain on the operating insulators and also reduces the power required to operate the breaker.

The hinge caps and clip caps are all supported by double insulators thus insuring a very rigid structure. The operating insulators work in babbitted bearings and the weight of each is carried by a bronze ball-bearing lubricated by a compression grease cup, thus insuring against deterioration and rendering the operation of the breaker exceptionally easy. The three operating insulators are connected to move simultaneously by a tie-rod and cranks. The center insulator pin has two cranks, the second being connected to the main operating shaft. The latter is vertical and carries at its upper end a crank which turns through 180 deg. for each stroke of the breaker, thus providing a toggle action at the start and end of each stroke.

All bearings of the breaker are made with fitted bronze pins and all links are adjustable, thus affording a good working fit, insuring against deterioration and allowing ready adjustment in assembly. The operating insulators have the distinction of being the largest rigid insulators ever constructed. They consist of three three-part porcelain insulators joined by semi-steel connecting pins of great strength and rigidity.

The breakers at the San Bernardino substation are now of the single-break type, but will later be changed to double-break when the pressure is raised from 87,000 volts delta to 150,000 volts Y. The breakers at the upper end of the line are, however, now provided with the double

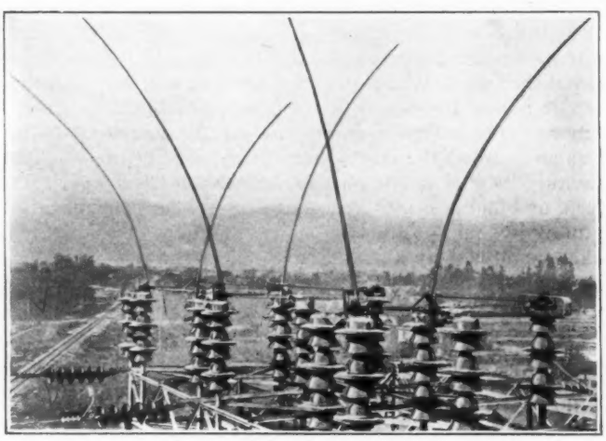


FIG. 6—150,000-VOLT SWITCH, BLADES CLOSED

break. At several intermediate points on the line Bowie circuit-breakers are also provided for sectionalizing or for crossover purposes. The installation at San Bernardino is of interest as it represents one of the largest outdoor substations ever constructed, having a rating of 12,000 kva.

A number of 44,000-volt Bowie circuit-breakers are used on the distribution system. Some of these breakers have already interrupted over twice their rated kilovolt-ampere capacity, showing the conservative rating of the apparatus used in these installations.

Illumination of a Polo Field

A field at Long Branch, N. J., to be used for playing automobile polo after dark, is now being equipped with electric lighting which will provide an illumination of 1 ft.-candle on the horizontal plane. The field measures 150 by 350 ft. and will be lighted by forty-eight 400-watt tungsten lamps with Holophane-D'Olier reflectors, the units being arranged in twelve rows of four each. Four lamps are suspended from each span wire carried by 35-ft. poles, thus bringing the lighting units at a height of 25 ft. above the ground. Service for the polo-field lighting will be furnished by the Consolidated Gas Company of Long Branch, of which Mr. F. R. Cutcheon is general manager.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Electrical Conveniences and the Servant Problem

In the vexatious endeavor to secure household servants in American cities the advantages of electrical conveniences in the home may serve as a lure. The Commonwealth Edison Company of Chicago in its advertising takes advantage of this fact. One of its recent display advertisements reproduced a "help wanted" advertisement from a German newspaper in which the householder, desiring a girl-of-all-work for his family of seven, called attention to the value of his electric washing and vacuum-cleaning machines for making the household work "light and pleasant." In its own advertisement the central-station company confirmed the arguments of the householder, making a plea that doubtless has considerable weight with housewives who are "up against" the servant problem.

Paducah (Ky.) Business Men Maintain Ornamental Lighting System

The ornamental street-lighting system at Paducah, Ky., which has been under construction for some weeks, is now in operation and the citizens appear well pleased with it. The section covered extends from First to Eleventh Street on Broadway, the city's principal business thoroughfare. More than 1000 incandescent lamps have been used, making the street "as bright as day." Strings of 25-watt tungsten lamps are festooned between posts, instead of the use of globes on ornamental iron standards, the expense of which was deemed objectionable. Paducah's "great white way," as the citizens proudly call it, is to be maintained by ninety-seven local business men who have interested themselves and will assume all expenses of operation.

Wiring Dwellings on a Rental Basis

To extend its service into rented dwellings the Union Light & Power Company, of Franklin, Mass., has had considerable success with a plan of installing and renting wiring installations to customers. If the landlord or tenant will sign a lease, the company offers to have installed electric wiring and fixtures to the amount of say $35, collecting from the lessee 21 cents monthly for the use of the installation. In case only $25 outlay is required for the wiring equipment, the rent charged is but 15 cents per month. Mr. W. K. Bradbury, contract agent for the company, reports that this plan has been the means of adding numerous tenants to the Union company's lines.

The rental charge of 15 cents or 21 cents per month is based on a return of 7 per cent on the company's investment of $25 or $35 respectively in the wiring job. Obviously the company's funds would be doing well wherever they can earn 7 per cent, so it was felt that if money were invested in wiring installations it would not only return good interest but also make possible new customers to use the company's service. At the local rate for energy, 15 cents per kw-hr., the average customer's business amounts to $16 to $18 per year so that the mere interest received is only one of the desirable returns enjoyed by the company. In addition this liberal policy also creates a good feeling in the community, which has not been slow to appreciate the easy means thus put at the disposal of householders to enjoy the benefits of electricity.

Of course, it is preferable that the landlord sign the lease for the wiring in order that the 7 per cent return may be assured to be continuous, but if the landlord will not sign, the company willingly accepts the present tenant's signature. When this tenant vacates the premises his own obligation ceases, but on the arrival of a new tenant the latter's business is solicited, and if he accepts service he is required to sign a new lease, unless the company has been able to induce the landlord to accept the lease himself or to buy the installation outright at its original cost less 10 per cent for cash. The proposition in itself is purely and simply one of rental, and the amounts paid in do not accumulate to pay off the original investment.

Another proposition intended to secure desirable residence customers has been the plan of allowing citizens in good standing credit to the extent of $50 for having their houses wired, provided this amount is returned to the company in twelve monthly instalments without interest.

A Central-Station Real-Estate Inquiry Office

Several months ago the Baltimore Gas & Electric Company announced that its electric office would answer real-estate inquiries and refer applicants to vacant property lying ready for occupancy and equipped with electric light and gas. As this service has become more generally known the volume of work handled by the counter-salesman who has the real-estate department in charge has been increasing rapidly, despite the close of the usual renting season.

During a recent summer month thirty-eight inquiries were received, the highest number on any day having been five. To these five persons the office referred 102 pieces of property. During the entire month 740 pieces of real estate were referred to applicants. In all, since the bureau has been in operation, 176 inquiriers have been informed of 2770 instances where desirable property was lying vacant, and at the end of this same period the company had listed 1286 properties for which tenants or purchasers were desired.

Illuminated Bulletins in Kansas City, Mo.

The Kansas City (Mo.) Electric Light Company is original in its method of securing additional sign-lighting load. Scattered about the city were about 300 old billboards averaging about 30 ft. in length. By an agreement on the part of the electric company to advertise on the boards and show the advantages of electrically illuminated bulletins to prospective advertisers, the Thomas Cusack Company was induced to remodel the boards and install electric lamps for illumination. The Cusack company, appreciating the possibility of securing additional advertising facilities, made the boards attractive by painting them white with the advertising in black. Sixty-watt lamps were placed about 25 ft. apart so as to illuminate the bulletin. In the contract the electric-service company agrees to vacate the board as soon as any advertiser desires space. Black and white has proved very satisfactory on account of its legibility. This method of advertising electric-sign service has increased the central-station company's load about 216 kw.

Analysis of Kilowatt-Hour Costs of Combination System

The accompanying data on the generating system and energy costs of the Pacific Gas & Electric Company, San Francisco, Cal., were brought out during a recent rate investigation by the San Francisco Board of Supervisors' committee on lighting and rates:

COST DETAILS, PACIFIC GAS & ELECTRIC COMPANY

		Per Kw-hr.
Cost of generation, on basis of 72,160,908 kw-hr.:		
Maintenance of generating capital	$45,813.57	$0.0006349
Generating expenses	530,770.98	.0073554
Taxes	110,247.48	.0015278
Fire insurance	62,018.16	.0008594
Casualty insurance	43,714.67	.0006058
Floating debt, interest	2,480.75	.0000344
General administrative expense	94,811.10	.0013153
	$889,956.71	$0.0123330
Cost of distribution, on basis of 66,957,215 kw-hr.:		
Maintenance of distribution capital	$123,296.29	$0.0018414
Outside work	186,669.26	.0027879
Statements and collections	34,551.94	.0005160
Office	106,976.93	.0015977
New business	67,706.94	.0010112
Sundry expenses	31,867.07	.0004759
Uncollectible accounts	17,601.07	.0002631
	$568,669.50	$0.0084932
Interest:		
Joint capital, $3,539,903.91 at 7 per cent	$247,793.27	$0.0034339
S. F. capital, $6,853,872.68, at 7 per cent	479,771.08	.0071653
		$0.0105992
Depreciation, 25-year annuity, at 7 per cent:		
Joint capital, $2,523,459.52	$39,897.16	$0.0005959
S. F. capital, $4,868,808.43	76,978.30	.0011496
		$0.0017455

SUMMARY OF COST OF ELECTRICITY

Maintenance of capital	$0.0024763
Generation	.0073554
Distribution	.0066518
Overhead expense	.0043426
Interest	.0105992
Depreciation	.0017455
Total	$0.0331708
Deduct revenue from minimum charge, $11,972.63	.0001788
Net cost per kw-hr	$0.0329920

AVERAGE RECEIPTS UNDER VARIOUS SCHEDULES

Schedule	No. of Meters	Per Cent	Kw-hr.	Per Cent	Amount	Average Price
"1912"	36,728	75	1,079,661	16.9	$76,066.59	$0.070454
"E"	280	0.6	282,114	4.5	9,911.95	.03513
"P"	14	0.0	4,478	.1	248.30	.0554
"L"	2,349	5	189,265	2.9	10,748.46	.05679
"A"	509	1	105,466	1.7	5,254.65	.04982
"P"	3	0.0	1,090	.1	60.00	.05504
Metered: Flat rates	7,425	15.5	4,128,469	64.6	122,261.96	.019614
Arcs: Flat rates	0	.....	583,010	9.2	21,510.05	.03689
Locked meters	1,396	2.9	.0	.....	.00	.....
	48,704	100.0	6,373,553	100.0	$246,061.96	$0.038606

Rate per Kw-hr., Cents	No. of Meters	Percentage	Kw-hr.	Amount
.08	27,044	74.00	523,103	$44,253.45
.07	5,086	13.80	176,810	12,399.76
.06½	4	.....	359	24.30
.06	2,681	7.15	132,592	8,380.52
.054	2	.....	285	15.40
.05½	6	.....	2,741	162.40
.05	1,233	3.25	104,053	5,254.51
.04½	4	.....	3,702	166.60
.04¼	1	.....	1,488	63.25
.04	667	1.80	134,528	5,346.40
	36,728	100.00	1,079,661	$76,066.59

The steam plants of the Pacific Gas & Electric Company produce about 78,000,000 kw-hr., in addition to which 19,000,000 kw-hr. is received from the hydroelectric stations of the system. Of the 97,000,000 kw-hr. thus available at the switchboard it is estimated that 31 per cent, or 30,000,000 kw-hr., is lost in distribution, in addition to 150,000 kw-hr. consumed by the company itself, leaving 66,957,215 kw-hr. as the basis for figuring cost of distribution. To nearby hydroelectric lines the company sells, however, about 5,200,000 kw-hr., making a total generation of 72,160,908 kw-hr. (to be exact), which is taken as the basis for calculating unit generating cost.

The tables herewith present details of the cost apportionment under the various headings, and also show the division of income under the several schedules of customers' charges in use.

One Operator's Rise to Independence

Three years ago the company operating a gas-engine-driven lighting plant in an Indiana town of 700 failed, and the plant was put up at receiver's sale. A bookkeeper earning a fair salary with a nearby traction company recognized in the unsuccessful lighting situation an opportunity to make some money if properly managed. Borrowing the amount, he bought in the equipment for $3,000 and started its operation. In the next two years he added $5,000 to his original investment, devoting this outlay to various plant improvements.

About a year ago the local strawboard works offered to sell him energy at 3 cents per kw-hr. with a reduced rate of 2.5 cents for all used above 10,000 kw-hr. per month. Accordingly the former gasoline plant was abandoned, the electrical equipment being moved to the company's factory. The strawboard company also installed second-hand duplicate equipment, running one generator off its line shaft while the other was connected to a small high-speed engine. The strawboard mill runs night and day so that service is available at all hours, but in order to save loss on his lines, the distributer furnishes day current for electric irons only on Tuesdays and Thursdays, except in cases of storms and dark days.

A five-year contract covers the present sales arrangement, at the end of which time the former bookkeeper-manager has an option for extending the service five years more. The mill furnishes all repairs to its generating equipment, but the operator donates his services in case of breakdown. This arrangement of purchased energy is found much superior to the former plan of separate generation, since energy is now never shut off except in the case of broken or fallen wires. The manager is also saved the worry and annoyance of operating a plant with a gas engine which, as he expresses it, "would rather rest than run."

The local central-station service now returns a gross income of about $5,000 a year from a town which the last census credited with 863 population. The street-lighting contract alone brings in $2,050 per year, part of the installation being arc lamps and the rest 100-watt tungsten units. The citizens of the town pride themselves on having one of the best-lighted communities in the State.

As already noted, some $8,000 has been invested in the local lighting service by the present owner, and now after three years' operation he is altogether out of debt. The plant is paying him 10 per cent interest on $20,000, besides a fair salary. As only about one-third of his time is, however, given to the electric-lighting service, he now plans to take on some occupation or business in addition to the cares of management.

Such an electric-lighting plant in a town even as small as this can be made to pay, declares this former bookkeeper in looking back over things accomplished since he resigned his job, but he insists that the business must be owned by one person and this individual be ready to devote to it some hard work, "with hands as well as with brains."

Alternating-Current Drive of a Newspaper Plant

By A. B. SPAULDING

In the past considerable business has been lost to central stations supplying only alternating-current service owing to the fact that until about a year ago it was necessary that direct current be employed for the operation of newspaper presses on account of the fine control required. The result could, of course, be accomplished by the introduction of a motor-generator set, but such equipment would cause complications and operate at low efficiency a great part of the time.

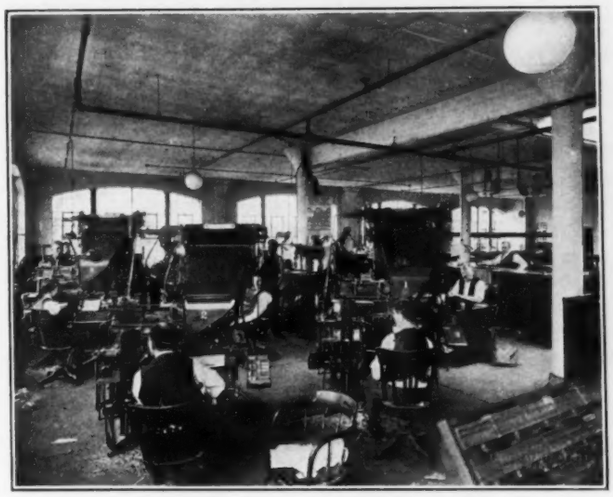


FIG. 1—LINOTYPE ROOM, INDIVIDUAL MOTOR DRIVE

One of the first applications of alternating-current press drive was made about a year ago at the new plant of the *Jersey Journal*, Jersey City, N. J. The building is new and modern in every respect. In the linotype and stereotype rooms individual motors are applied to all machines.

Of particular interest is the press room, in which are installed two sextuple Hoe presses, each with a capacity of 48,000 twelve-page or 36,000 sixteen-page papers per hour. These presses are each operated by two motors, one

FIG. 2—STEREOTYPING DEPARTMENT, JERSEY JOURNAL PLANT

7-hp unit for starting and one 50-hp motor for running. These motors are standard General Electric 220-volt, 60-cycle, two-phase machines with wound rotors, and for convenience are installed in pits beneath the floor. Liability of shut-down through motor trouble is eliminated by a counter-shaft, which by a few minutes' work allows either set of motors to operate either press.

Paper is brought to the presses by monorail cranes of the Sprague type, of which there are two, one for each press. As the rails extend over the presses, the cranes were used for the first assembly of the machines and are now available for the removal of heavy plate parts when changes or repairs are necessary.

The Cutler-Hammer Kohler control panel for the presses

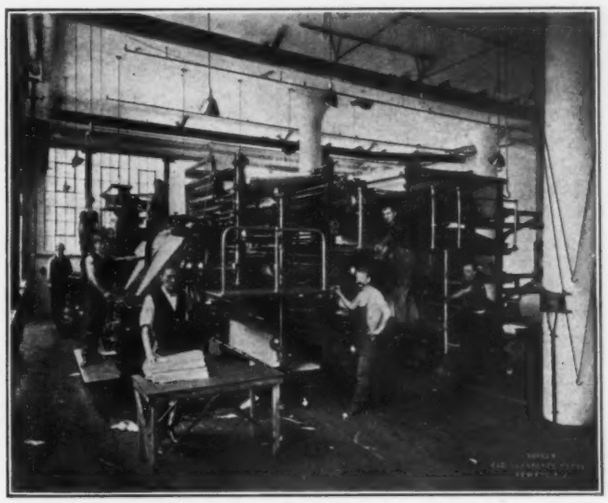


FIG. 3—PERFECTING PRESS DRIVEN BY ELECTRIC MOTOR

is installed on a solid cement shelf in one corner of the press room, and while easily accessible does not take up floor space.

Direct current for the operation of the control panels is furnished by a small motor-generator set, shown to the left in the photograph, and the control is quite as fine and reliable as with direct-current motors.

Two-phase, sixty-cycle, 220-volt alternating-current service is furnished by the Public Service Electric Company, primary energy at 2300 volts being brought into a transformer vault in the basement, where it is stepped down to the local pressure. The primary wires are brought from an overhead distributing system through lead cables, which are installed in duplicate, as are also the transformers,

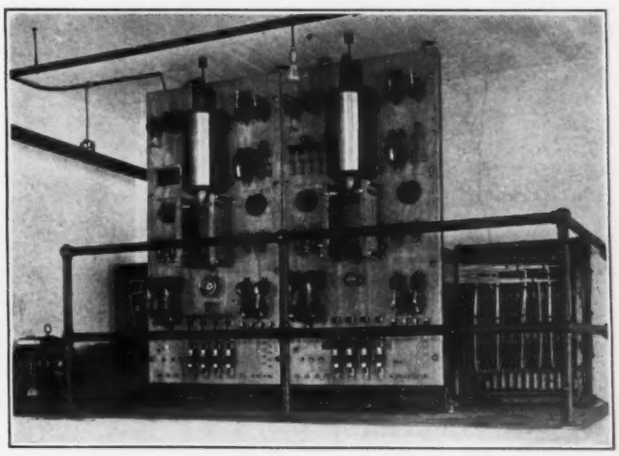


FIG. 4—AUTOMATIC CONTROL FOR PRESS MOTORS

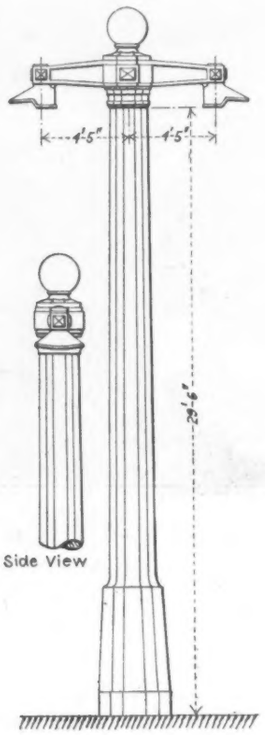
thus relieving the customer of the worry about breakdown from these sources.

This *Jersey Journal* installation has been in operation for about one year and has given no trouble in any way. The owners are enthusiastic over the equipment and declare they would never return to the operation of a private plant with its added expense and annoyance.

Illumination and Wiring

Concrete Brackets for Panama Lock Lighting

The accompanying sketch shows the revised design for the concrete lamp brackets to be used in illuminating the canal locks at Panama. Mr. M. J. Schiavoni, assistant



CONCRETE LIGHTING BRACKET

architect of the Canal Commission, prepared the approved design.

The entire bracket, reflectors and ball finial will be of reinforced concrete cast in iron forms manufactured at Gorgona shops, from drawings furnished by the Lighthouse Subdivision. The latter will also fabricate the concrete brackets, 511 in number, consisting of 302 single-arm and 307 double-arm brackets. Each concrete double-arm bracket, with reflectors, will weigh approximately 1610 lb. The solid-ball finial, weighing 730 lb., will be employed to counterbalance the weight of the single-arm brackets on the middle locks. The standards measure 29 ft. 6 in. to the cap supporting the cross-arms. The horizontal distance between lamps is 8 ft. 10 in.

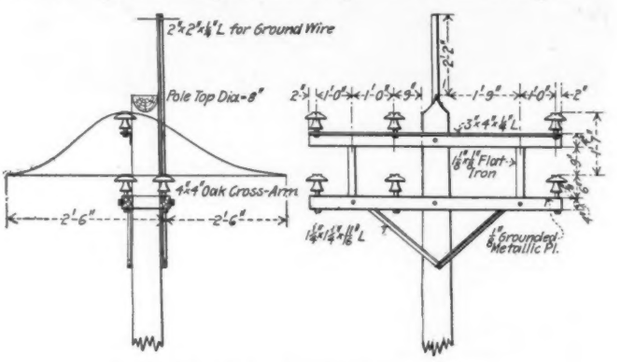
High-Tension Crossing Construction with Protective Loop

In the accompanying sketch is shown the 6600-volt overhead crossing construction adopted by the Dayton Power & Light Company, of Dayton, Ohio. This design adheres generally to standard specifications but has the added safeguard of an extra loop passing over a pin-type insulator on the upper cross-arm. As initially constructed this loop is free of all other tension than that imposed by its own weight, but if an insulator of the crossing span breaks the upper insulator at once comes into play to support the line both mechanically and electrically. This eliminates possibility of the power line falling and endangering lives.

For railroad crossings this extra-loop construction is employed on the poles at each end of the 90-ft. crossing span. A minimum height of 30 ft. is imposed from track rails to the lowest wire. The adjacent 135-ft. spans are also double-guyed with 5/16-in. stranded-steel cable, each pole top being tied to the adjoining pole butt. For a single-circuit, three-phase line, as shown, all conductors are mounted in the same horizontal plane on four-pin arms. The lower arm is of 4-in. by 4-in. oak, capped with a ⅛-in. metallic ground plate, while the upper arm, on which the emergency loop insulators are mounted, is of 3-in. by 4-in. by 0.25-in. angle section. Anchoring the upper arm rigidly to the lower is a pair of vertical, flat 1.125-in. by 0.25-in. braces, which also serve as ground connections.

Another form of crossing construction reported from Ohio by the electrical transmission committee of the Ohio Electric Light Association involves a reversed catenary arrangement. The regular catenary construction—that is, a suspension cable with loops down to support the feed wire—was considered objectionable, because some difference of potential through leaks might set up rapid depreciation.

The plan adopted was the extension of the main feeder straight through over the crossings the same as in the other part of the line (except for the addition of the double arming on either side of the crossing) and on this main feeder over the space to be protected loops were connected perma-



HIGH-TENSION CROSSING CONSTRUCTION

nently to the main line every 5 ft. The loop wire was of the same size copper as the feeder. The loops were allowed to extend down about 4 in. below the feeder, then through these loops another copper wire of the same size and capacity as the feeder was run. This wire was allowed to hang free in the loops, and extended to and beyond the insulator supporting the feeder on either side of the space to be protected, where the free wire is connected to the feeder with a good soldered joint. Should the feeder break from any cause the free wire will then support the feeder and prevent it from coming down or doing any damage to the crossing, while at the same time continuity of service will be unimpaired.

Rectifier-Tube Operating Records at Detroit

High average and individual life records in the operation of rectifier tubes have been attained by the public lighting plant at Detroit, Mich., where advantage is taken of the low-temperature cooling water flowing through the Detroit River from Lake Huron. One 4-amp seventy-five-lamp tube has, for example, been in continuous service 11,629 hours. Another tube, started Aug. 15, 1910, ran until May 6, when it was removed after 10,562 hours' use.

For the ninety-seven tubes now in use a total of 324,416 tube-hours has been recorded, an average of 3344 hours per tube. Forty-five tubes now resting showed an average life of 2692 hours, while 101 which have been discarded ran 2696 hours each. These 243 tubes have altogether, therefore, run 712,831 hours, or an average of 2933 hours per tube.

A mean operating temperature of 80 deg. Fahr. is main-

tained at the tubes, the cooling water taken from the Detroit River in front of the station ranging from 33 deg. in winter to 70 deg. in summer. Nearly 3400 General Electric 4-amp magnetite lamps are now in service for lighting Detroit's streets.

Side-Bracket 44,000-Volt Transmission-Line Construction at Panama

The permanent 44,000-volt transmission line across the Isthmus of Panama is now under construction. This line, as already mentioned in our columns, will transmit hydroelectric energy from the water-power plant at the Gatun spillway to load centers at Miraflores, Balboa and Cristobal, supplying power to operate the locks and lock lighting, bascule bridges, wireless-telegraph stations, etc. At Miraflores the present steam-turbine plant will be tied into the system as a relay station to insure continuity of service.

The unusual bracket form of construction for supporting these 44,000-volt conductors on suspension insulators is shown in the accompanying sketch. The track-span bridge supports one of the duplicate three-phase lines on each side of the railroad tracks. The conductors are No. 00 and are 5 ft. apart and 5 ft. from the frame. The insulators are of vitreous porcelain, in three units. The insulator fittings are made entirely of monel metal to resist climatic corrosion. A ground wire for protection against lightning is carried at the top of each side frame. The ground wire is 5/16-in. copper-clad solid wire. The copper sheath, of nearly one-half the area of the wire, surrounds an amalgamated, carefully selected steel core.

The bridges are spaced on 300-ft. centers, a total of 917 being required to cross the Isthmus. The span between side frames is 36 ft. The track-span bridge, in addition to supporting the duplicate transmission lines, admits of the suspension of a catenary trolley construction, should it prove desirable in the future to electrify the Panama railroad. It also has several advantages for transmission purposes. By paralleling the Panama railroad, material can be brought to within a few feet of the point of actual erection. The side-bracket suspension of the conductors separates the duplicate lines so that a burn-out in one will in no manner affect the other. The conductors are outside the track and will be comparatively free from deterioration caused by smoke from the locomotives. The structure itself is fundamentally strong and is capable of easily resisting all strains introduced by breaks in the wires.

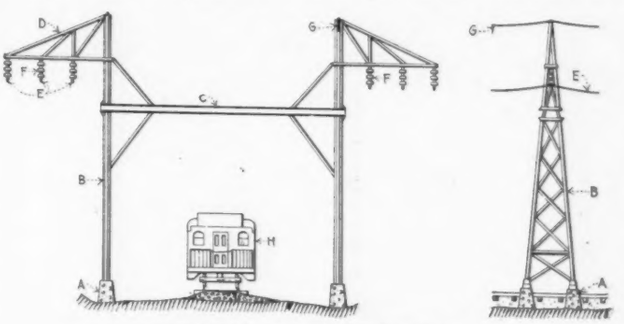
The No. 00 copper conductors are seven-stranded pure copper cables, totaling 1,500,000 ft. in length. The individual strands are manufactured without either a soldered or a welded joint. Splices in the cable will be made with soft-copper sleeves. The conductors are suspended at the insulators from monel-metal fittings bushed with copper sleeves. Thus, in the entire line there will be no point where the copper strands are in contact with a second metal.

At each bridge, the ground wire will be clamped to the tower, and a positive T-connection through a copper wire will be made to ground plates buried in the earth. These ground plates are being manufactured from old scrap copper and cable which have accumulated at the Empire storehouse. By frequently earthing these ground wires, it is expected that line trouble and substation burn-outs caused by lightning will be reduced to a minimum. About 500,000 ft. of copper-clad wire is required for the two ground conductors.

The insulators which will support the conductors are of two types, suspension and strain, each assembled of three porcelain disks, 10 in. in diameter, joined by monel-metal fittings. This metal is used on account of its unusual strength and its ability to resist corrosion. Galvanized fittings, customarily used in the United States and abroad, are practically worthless in the Isthmian humidity. The strain insulator is to be used on sharp curves and for anchoring at intervals. The suspension insulators will be used on tangents and light curves. In all, 4000 suspension insulators and 2500 strain insulators have been ordered for the entire line.

In the design of the bridge the steel is so distributed as most efficiently to resist the maximum stresses incurred. The side frames are A-frames, to resist uprooting of the bridge in case all wires are down in one span. The crosspiece is made of two channels, which are cross-braced to carry the longitudinal pull of the catenary construction which may be attached if the railroad is later electrified. The side brackets for supporting the conductors are three-legged, being designed to resist both gravitational and torsional forces. Brackets and crosspiece are braced to the side frames so that the entire bridge acts as a unit to resist side pull on sharp curves.

Considerable study has been given to the concrete foundations for the track-span bridges. There will be two pedestals under the two legs of each side frame, the pedestals resting upon a spread slab reinforced by scrap-steel rails. Each leg will be fixed to the pedestal by a pair of 15-in. anchor bolts, clamped at the lower end to the steel rails in



SIDE-BRACKET CONSTRUCTION

the spread slab. To anchor the pedestal foundation holes will be drilled and sprung at the bottom with light charges of dynamite. These holes will then be filled with concrete, reinforced with long bars, to which the pedestals will be fixed, making a construction of great strength against both horizontal and vertical forces.

Recent Telephone Patents

Under some circumstances, especially where the message rate system of charging is in vogue, it is desirable to lock a telephone instrument against use. A lock for this purpose is the subject of a patent granted to Mr. A. Fornander, of New York City. The lock is for desk-stand sets. The lock proper is mounted upon a sheet-metal clamp which is in two parts hinged together to clamp the upright of the desk stand. The arm supporting the lock extends from one of the half cylinders, terminating in a hook which engages the eye of the switch lever to retain it in the depressed position. An arm extending from the edge of the second half cylinder is bent to form a box which will register with and completely cover the lock, the strike for the lock being inclosed within this box. When the clamp is placed in position and the box forced home over the lock, the latch engages and holds the clamp in position. The hook switch lever is accordingly held in the depressed position.

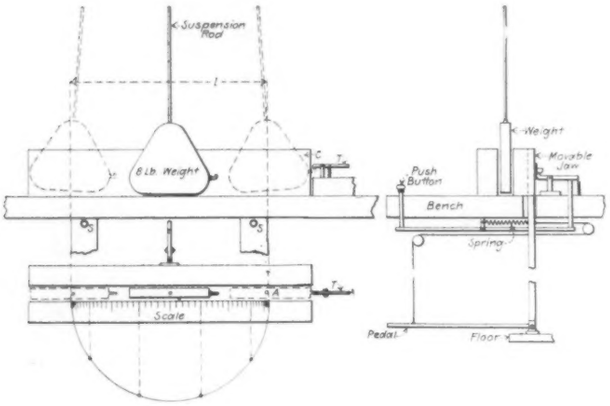
Mr. J. McCausland, of Providence, R. I., is the inventor of a sanitary mouthpiece. This is a removable arrangement of paper or other destructible material which is designed to rest in a clamp secured to the transmitter. Each user can destroy his own mouthpiece and the next user inserts a new one in the clamp.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

A Milli-Hour Stop-Pendulum

A useful decimal method of testing watt-hour meters which avoids the usual calculations is that due to Mr. O. A. Knopp, of the Pacific Gas & Electric Company, San Francisco, Cal. By this method the time of the meter to complete one, two or three revolutions is taken with an applied load in watts equaling 100, 200 or 300 times the disk



SKETCHES SHOWING ESSENTIALS OF A MILLI-HOUR STOP-PENDULUM

constant. This time interval for a correct meter is supposed to be 0.01 hour. Heretofore these disk time measurements have been made with a special stop-watch whose large hand makes one revolution in 0.01 hour. The dial itself is in turn divided into tenths and hundredths. For laboratory and standardization work, however, this stop-watch was found to introduce slight inaccuracies on starting, so Mr. Knopp recently developed his milli-hour stop-pendulum having a period of 0.001 hour and eliminating starting errors.

In this device the flat triangular bob, weighing 8 lb. or 9 lb., hangs on a 0.125-in. steel rod about 10 ft. long with double-diamond jewel suspension. The bob of the pendulum thus formed swings between two parallel oak jaws, one stationary and the other movable. By means of a foot-lever the jaws can be opened, allowing the bob to swing freely, but a light pressure on the push-button releases the movable jaw, causing it to be closed with force against the bob by two strong springs, and thus clamping the pendulum instantaneously in its momentary position. A scale the length of the pendulum's path is divided into five equal time intervals, each representing 0.01 milli-hour or 0.00001 hour.

When testing the meter, the time of measurement taken is 0.01 hour; hence the pendulum should complete just ten double swings or cycles, returning to the end of its path at the same instant that the meter has made the allotted number of revolutions. If the weight stops at one of the one-fifth interval divisions ahead of the end position, the correction factor would be 0.99. If it stops one-fifth behind, the correction factor is 1.01.

A simple graphical method suffices for the harmonic division of the scale. It is only necessary to erect a semicircle on the path-length as shown, and to divide this circumference into the desired spaces, projecting the divisions onto the straight path. The pendulum should have a theoretical length of 323 cm, or 10.6 ft., measured to the center of gravity of the bob. The invention described is protected by United States patent issued to Mr. Knopp and assigned to the Pacific Gas & Electric Company.

Improving a High-Speed Engine

By W. H. Wakeman

The valve gear on a high-speed directly connected engine, which runs at 274 r.p.m., being noisy on account of lost motion internally, repairs were made at the first opportunity. The piston valve of the engine, which admits steam to the cylinder by the middle and exhausts it past each end, is illustrated in Fig. 1. A hole cored through the center of this valve was left as it came from the foundry. Two nuts were locked on the threaded valve stem, as shown at the right hand; the stem was then inserted in the valve, and two more were locked at the other end. No device was provided for holding these nuts in place.

It was a difficult matter so to adjust the nuts that they would not bind on the valve (as the stem must be free to move enough to compensate for error in alignment) and still prevent lost motion endwise. A special wrench, necessary for this job owing to the shape of the valve, was not supplied by the builders.

To overcome these objections the two outer nuts were removed, and the stem drawn out of the valve. One of the inner nuts was securely pinned to the stem as shown at 2; it will never be necessary to turn this nut, as the length of the stem can be adjusted by the threads shown at the right-hand end. This stem, which is 1⅛ in. in diameter, was inserted in the valve, and the exact length marked on it at 3. It was again withdrawn, put in a lathe and the end turned down to ¾ in., leaving a square shoulder at 3. A thread was cut to fit nuts of standard size, and a hole was bored for the cotter pin shown.

The stem was inserted in the valve again, a washer ⅜ in. thick was put against the shoulder, 3, the two nuts were arranged as shown, and a cotter pin was employed to prevent them from coming off in case they should become loosened. The stem can now be moved sidewise but there is no lost motion endwise and the operation is entirely satisfactory. Later, when the parts in contact become worn enough to require adjustment, the stem will be put in a lathe and a light cut made on the shoulder, 3, thus taking

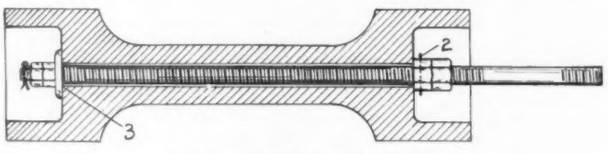


FIG. 1—REPAIRS TO VALVE

out the lost motion; this change will not be required for a long time as the parts wear slowly.

In order to be able to view the piston valve in motion and set it while the flywheel was turned by hand, the steam chest cover was removed. Fig. 2 shows three openings provided solely for observation purpose, steam not being allowed to pass through them under normal conditions.

The admission valve is visible through 2 and the exhaust through 3 and 4. When the steam-chest cover was first packed holes were cut in the packing corresponding to the openings shown, although no holes were necessary. This arrangement left a comparatively narrow strip of packing between the wide and narrow openings, and a piece of this strip was missing as shown at 5, and there was a free

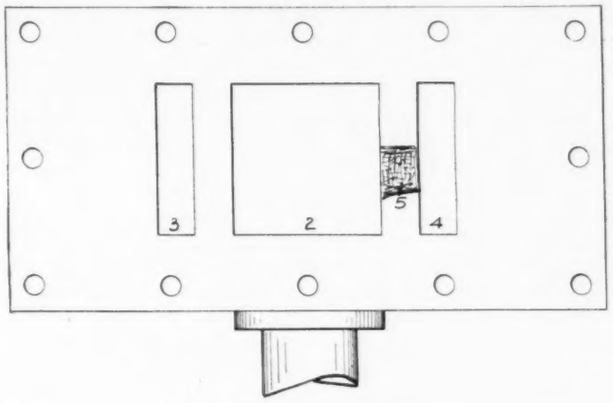


FIG. 2—DEFECTIVE PACKING

passage for steam to blow from the live-steam opening, 2, directly into the exhaust opening, 4, and thence into the exhaust pipe.

After carefully removing all of the old packing, use was made of a piece large enough to cover the entire surface. The only holes cut in it were round ones for the studs. After covering the outer surface with graphite it was put in place and the cast-iron cover was replaced.

This engine is fitted with a cast-iron baffle plate as illustrated in Fig. 3. It is located between the piston-rod stuffing box and the cross-head to prevent water that comes out around the rod when the packing is getting old from mixing with oil on the upper and lower guides. The shallow stuffing box illustrated at 2 allowed a small quantity of water to pass. On the inward stroke the packing in the stuffing box wiped water off from the rod, and allowed it to trickle down the face of the baffle plate and mingle with oil

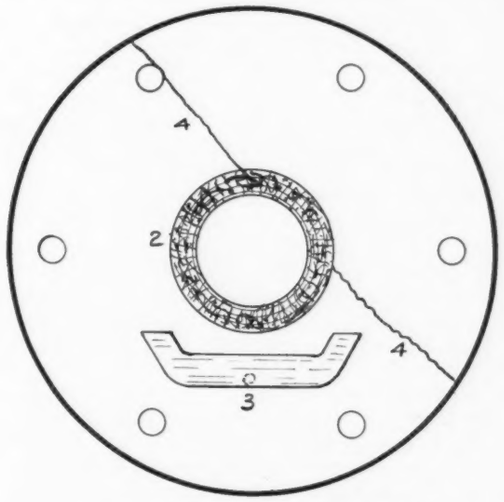


FIG. 3—REPAIRS TO BAFFLE PLATE

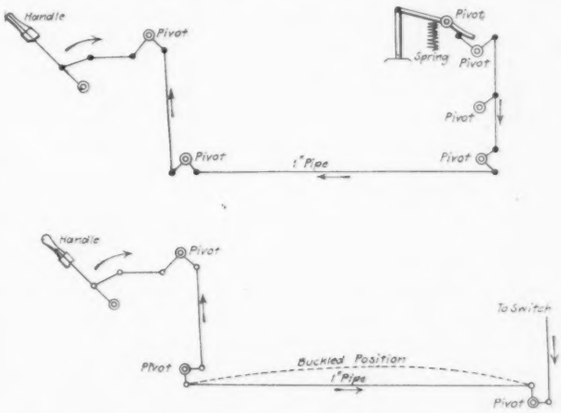
in a small reservoir below the lower guide. In order to overcome the above-mentioned objection a copper trough was soldered to the plate as shown at 3. A hole was drilled through the plate, and a brass tube was inserted on the opposite side to deliver the water where it will do no harm.

After the six cap screws which hold this baffle plate in place were removed, leaving the plate loose on the piston rod, the flywheel was turned on another account. Just before the inside center was passed, the cross-head caught and broke the baffle plate as indicated by the line 4, 4. The piston rod was unscrewed from the cross-head, the plate was removed and a ring of wrought iron was put on it while hot. As the ring cooled, the broken parts were drawn together perfectly, the plate being thereby made nearly as good as when new at very small expense.

Switch Pull-Rods in Tension, Not Compression

The oil switches in a certain substation had given trouble ever since the time of their erection. They were operated by long rod-and-lever connections as shown in the accompanying sketch, and the switches controlled a 25,000-volt three-phase line. The difficulty seemed to be that the operators continually broke down the castings of the mechanism, effecting automatic release from the handle. Complaint was made, too, that the switches were hard to open and close.

After investigation it was found that the levers and pull-



FIGS. 1 AND 2—CORRECT AND INCORRECT ARRANGEMENT OF SWITCH PULL-RODS

rods had been wrongly connected, the arrangement being such as shown in Fig. 2, which placed the long 1-in. pipe in compression when the switches were being closed. This caused that part to sag, jamming and blocking the mechanism. The rods were then overhauled and converted to the arrangement shown in Fig. 1, a spring being added, thus putting the parts in tension during operation. Since this change was made the switches have worked easily and without further trouble.

Meters on Open-Delta-Connected Circuits

Will you kindly state what method can be used for metering the energy consumed by a single-phase motor operating upon one phase of a three-phase system, and what is the usual method of measuring energy supplied from the secondaries of two open-delta-connected transformers?

M. B. H.

The load taken by a single-phase motor can be registered on a single-phase meter without any regard whatever to the number of phases of the supply system. The energy delivered from the secondaries of two open-delta-connected transformers in a three-phase system can be properly recorded on two meters having their series coils connected in two of the wires and each voltage coil connected between the corresponding lead and the third lead of the system. This is the usual method of measuring energy in a three-phase system by means of two meters. This arrangement of meters measures the energy correctly under every conceivable condition of balance or unbalance, high or low power-factor, lagging or leading current.

Letter to the Editors

Copper-Clad Steel Suit

To the Editors of the Electrical World:

Sirs:—In the issue of the *Electrical World* of July 12, 1913, on page 68, is an article entitled "Decree in Copper-Clad Steel Infringement Case," which contains some serious misstatements of fact. The statement is made in the first paragraph of the article referred to that "the chief contention in the infrigement case arose over the question whether the product sold by the Standard company was one in which the copper covering was actually welded to the steel core or base, for if such a weld existed, it was argued that the Colonial copper-clad product clearly infringed the Monnot patent, No. 893,932, granted July 21, 1908, for improvements in copper-clad iron and steel and owned by complainants." Other statements in the article are to the effect that because of testimony showing the Standard company's product to lack a welding of the components the bill was dismissed.

The natural inference from this statement is that the Standard company's product, by reason of some lack or failure, is inferior to the Duplex company's product. Now, instead of such a state of affairs existing, the proofs in the case show that the Standard company's product is actually superior to the Duplex company's product, and especially in respect to the intimacy of the union of components. This being so, it must be plain that such statements as are contained in the article referred to are not only misleading, but are such as to work injury to the Standard company.

The facts being as stated, two questions remained which were important in the case; one was whether the Standard company infringed the Monnot patent, and the other was whether the Monnot patent was a valid patent. The Standard company is manufacturing under Griffith patent No. 580,344, granted in 1897, eleven years before the Monnot patent in suit was granted, and the mere statement of this fact will afford some indication of the weakness of the claim that the defendant manufacturing under the Griffith patent was infringing the Monnot patent, Griffith's junior by eleven years.

The question of weld entered into the controversy, but the question was not whether the Standard company's product revealed a weld, but whether it revealed a weld *within the meaning of the Monnot patent in suit.*

The manufacturing operation upon which the Monnot patent is predicated is an operation which involves a bringing together of molten copper and solid steel and a consequent intermingling or alloying of copper and steel at the surface of contact. The Standard company's operation involves the bringing together of solid bodies of copper and steel, the surfaces having been properly cleaned and prepared, and then the uniting of them by heating and pressure, but at no time in the Standard company's operation is either component melted. The result of the Monnot operation is in the Monnot patent *called* a weld, but manifestly it is not a weld, it is an alloy union. The union which the Standard company produces by heating and pressure is, on the other hand, a true weld. The question of infringement turned on whether the Standard company's union was a weld *within the meaning of the Monnot patent*, and upon that question there could be no uncertainty.

It is said in the article complained of that it was the *defendant's* expert who testified that the Colonial company's operations could not produce a true weld. This is not the case; the defendant's expert testified that in following the Colonial's operations a union was produced which was a weld, but was not the sort of a union which in the Monnot patent is called a weld.

It was the *complainant's* expert (and not the defendant's, as the article says) who testified that the Colonial company's operation could not produce a weld, and when that testimony was given the witness was giving the word "weld" the meaning with which it is used in the Monnot patent in suit.

Thus it will be seen that the essential question in the case was not whether or not a weld existed, but whether or not the defendant was producing what the patent in suit described, and this was proved not to be the case.

As was said above, another serious question in the case was whether the Monnot patent was a valid patent; and manifestly when the complainant came into court with a motion to dismiss the bill, it was ready to forego any chance of success and to pay the costs of both parties to the suit rather than to run the risk of a decision which should declare its patent to be invalid.

So far as the legal matters are concerned, the conclusion of this case is a victory for the defendant, and so far as practical matters are concerned, the testimony in the case is that as between the products of the two companies, the union of the components is in the Standard company's product more secure than in the Duplex company's product.

P. H. W. Smith,
Vice-president Standard Underground Cable Company.
Pittsburgh, Pa.

[The printed records in the case are very voluminous, there being 412 pages for the complainant and 1452 pages for the defendant. The article referred to was merely an outline of the prominent features of the official record, being confined largely to the decree of the court and the affidavit of the treasurer of the complainant company in accordance with which the decree was rendered. In view of the additional facts now brought forward it seems well to restate the decree of the court, as follows:

"Complainant having admitted that defendant's product referred to in the proofs herein does not infringe the Monnot patent in suit, No. 893,932, it is ordered, adjudged and decreed that the bill of complaint herein, in so far as it is based on alleged infringement of said patent, be, and the same hereby is, dismissed on the ground that defendant has not infringed said patent, and so dismissed with costs to be taxed."

Patent No. 580,344, issued to Mr. William Griffith on April 6, 1897, contained one claim, as follows:

"The herein-described process of uniting or welding plates of metal of different kinds, which consists in cleasing one of the plates from scale, oxide or other impurities, then coating or covering one or more faces of this plate with a metal or an alloy thereof having a lower fusing point, then applying to this coated surface a plate of metal or an alloy of the same character as the coating, but free from any coating, then applying heat to the two plates, and finally uniting by pressure, substantially as described."

Patent No. 893,932, issued to Mr. John F. Monnot on July 21, 1908, contained the following two claims:

"1. As a new article of manufacture, a ferrous base having a welded-on, continuous, poreless, dense coating of copper united therto by a union resisting temperature changes, cutting tools and mechanical stresses, said coating having the properties of metal set from a liquid state.

"2. As a new article of manufacture, an extended metal article comprising a ferrous metal base and a continuous, poreless, dense coating of copper weld-united thereto by a union resisting temperature changes, cutting tools and mechanical stresses, said ferrous base and copper coating having been extended together."

In the article appeared the statement that the "expert for the defendant had testified that the process of manufacturing copper-covered steel wire * * * could not produce a true weld." The expert was Prof. Albert Sauveur of Harvard University, who was called as a witness for the complainant, but testified as stated in the course of his examination by the defendant's counsel.—Eds.]

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Brush-Contact Resistance.—ALFRED HAY, M. H. BRATT AND J. M. PARISH.—An illustrated account of experiments in brush-contact resistance, the main object of which was to ascertain how far the brush-contact drop is affected by the rotation of the commutator. In the method used care was taken to eliminate the effect of emf in the armature due to imperfect commutation. The conclusion is reached that the brush-contact loss when a machine is running is, for all practical purposes, identical with that which occurs in a stationary armature, so that the loss can be easily determined by measurement with the armature at rest. This result is in agreement with that of several other experimenters, but differs radically from the results of Gratzmuller.—London *Electrician,* July 4, 1913.

Commutation Dynamos and Motors.—A note on a recent British patent (14,236, 1912) of M. Déri. Sparkless commutation is obtained by arranging pairs of brushes so as to prevent the armature coils from being directly short-circuited. The brushes for each pair of poles are kept connected to an external circuit in which are produced alternating pressures of the frequency of commutation. To effect this an auxiliary machine having coils inserted between the two brushes of every pair, and acted on inductively by a field energized from the main circuit, may be used with or without condensers.—London *Elec. Eng'ing,* July 10, 1913.

Lamps and Lighting

German Illuminating Engineering Society.—E. WARBURG AND LIEBENTHAL.—The official report of the first general meeting held in Leipzig, May 31, by the Deutsche Beleuchtungstechnische Gesellschaft. The president, E. Warburg, reported on the negotiations concerning the formation of an international illuminating engineering committee. Papers were presented by Brodhun on units of light, by Lummer on the evaporation temperature of carbon in the arc lamp, by Martens on the reduction of light intensity for photometric purposes, by Lummer on a new method of determining the true temperature of filaments in incandescent lamps, and by Monasch on the present inconveniences in the rating of automobile lamps. Abstracts of some of the papers will be presented elsewhere in the *Digest.*—*Jour. f. Gasbel. u. Wasservers,* July 12, 1913.

Units of Light.—BRODHUN.—An abstract of his paper read before the German Illuminating Engineering Society. There seem to be good prospects of using the thermodynamic black body for defining the rational unit of light. The author also discusses the attempts to arrive at an absolute method of photometry. The scheme is to investigate the distribution of energy in the spectrum of the source of light to be investigated, to determine the sensibility curve of the human eye for different wave-lengths and to calculate therefrom the distribution of light intensity in the spectrum, and to arrive finally at the total candle-power. Several difficulties must be overcome before this scheme can be realized. There must be an international agreement as to the sensibility curve of the average normal eye. Further, suitable apparatus must be devised and tested, and finally an international absolute unit of light must be agreed upon. This means many difficulties to be overcome. A simpler problem which is equally desirable is at present the construction of a unit lamp which fulfills all requirements. There was an extended discussion of the possibilities of using the black body as the basis of a rational unit of light. The best ways of accomplishing this were discussed and it was emphasized that the black body should be used only in scientific laboratories, while for engineering purposes electric incandescent lamps will be used as heretofore as secondary standards.—*Jour. f. Gasbel. u. Wasservers,* July 12, 1913.

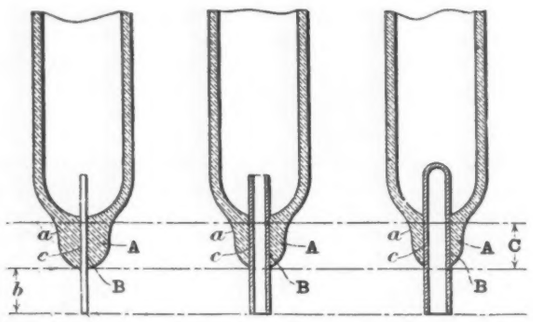
Temperature of Filaments in Incandescent Lamps.—LUMMER.—An abstract of a paper read before the German Illuminating Engineering Society on a new method of determining the true temperature of the filaments in incandescent lamps. If the law for the total radiation is known for a substance and the radiation constant is also known in absolute units, it is possible to determine from the Joulean heat the true temperature of a filament of given surface, if the total electrical energy supplied to the filament is changed into radiation. For the absolute black body and for bright platinum the radiation laws are exactly known. For other metals the theory of Aschkinass must be employed. The authors have made experiments with platinum filaments and discuss in this paper the various assumptions made in this method.—*Jour. f. Gasbel. u. Wasservers,* July 12, 1913.

Reduction of Light for Photometric Purposes.—MARTENS.—An abstract of a paper read before the German Illuminating Engineering Society. If the light used for illuminating the surface under test is reduced by screening off a certain portion of it by placing in the path of the light a non-transparent disk with an open sector the angle of which may be varied, the light will be reduced properly, but no uniform illumination of the surface is obtained if the disk is stationary. The author, therefore, lets the light passing through the sector in the disk pass into an Ulbricht sphere the white inner surface of which is uniformly illuminated by reflection as far as it is not illuminated directly by the incident light. To complete the arrangement so as to have a portable photometer for white light, a white ring surface is provided on the outside of the sphere with an opening through which the observer looks into the sphere. The observer looks at the white ring with the hole in it and changes the angle of the sector until to the eye the hole in the ring disappears. This gives a measurement of the light by which the white surface with the hole in it is illuminated.—*Jour. f. Gasbel. u. Wasservers,* July 12, 1913.

Searchlight.—GOERGES.—An illustrated abstract of a paper read before the Dresden Electrical Society. The author describes tests of a searchlamp with a mirror of 600 mm diameter and 260 mm focus, the arc lamp being operated normally at 80 amp and being provided with horizontal carbons. The searchlamp was tested in an inside room at 85 volts and 80 amp, 100 amp and 120 amp, with carbons of different manufacture and of different diameters. With highest concentration of the light the maximum illumination obtained was 850,000 lux. The author sees no reason why even searchlamps of largest size cannot be tested in inside rooms of sufficient dimensions. Tests of searchlamps in the free air over long distances will always yield uncertain results because the transparency of the air varies greatly.—*Elek. Zeit.,* July 3, 1913.

Hermetically Sealing Electric Conductors Through Glass.

—George B. Burnside.—The method described depends for its success upon the cooling of the conductor and the surrounding glass in such a way that considerable local differences of temperature are avoided. Perfect seals may be effected between the more easily oxidizable metals, such as copper or iron, and glasses having comparatively low fusion points, such as German and lead glasses, and, further, between such metals as platinum and materials having higher fusion points, such as Jena glass and fused quartz. First, the electrical conductor is inserted through an aperture or passage in the glass. The glass around the conductor is then strongly heated by means of a blow-pipe flame until perfect cohesion has been attained between the glass and the conductor. The seal is at this point taken out of the flame, and when it reaches the temperature corresponding to a dull red heat the leading-in wire and the glass surrounding it are cooled by several immersions in a special bath. The bath may consist of sperm or other oil, wax or fat; it is advisable that the cooling bath should be previously warmed slightly. Each immersion should last about two or three seconds. The depth of immersion is increased with each consecutive dip until the seal is completely cooled out. In practice it has been found very convenient to cool the seal by bringing a small vessel of oil up around it and applying this small cooling bath in the manner just described. If desired, the conductor may be coated previous to the sealing-in process, or the sealing-in process may take place in an atmosphere of hydrogen or other inert



FIGS. 1, 2 AND 3—HERMETICALLY SEALED CONDUCTORS

gas, in order to prevent oxidation. If the conductor is required to carry a current of not more than 15 amp, it may consist of a solid wire of circular cross-section. If, however, the current to be carried exceeds 15 amp, the conductor should be tubular, and it may be subsequently filled with an electrically conducting substance. With German and lead glasses, conductors of copper, nickel, platinum, etc., may be used, but with Jena glass and fused quartz it is necessary to employ platinum. In the accompanying drawings Figs. 1, 2 and 3 represent seals made according to this method. Fig. 1 shows a seal of German or lead glass *A*, and a wire *B* of copper or some other metal. In Figs. 2 and 3 the electrical conductor *B* is of tubular form; the tube is shown closed at one end. It is advisable to use the tubular form of conductor when the method is applied to the construction of mercury-vapor lamps and vapor rectifiers; the tubular shell *B* should be made of a substance such as platinum, which does not form an amalgam; it thus acts as a protecting cover to the plug of better-conducting material *D*, which is chemically acted upon by mercury. In the diagrams *C* represents the portion of the seal which is ultimately immersed in the cooling bath during the process of making the seal. The explanation of the success of the method is that the temperatures at *a* and *c* are approximately equal and if there were any difference of temperature at *a* and *c* it would be such that the glass would not contract away from the conductor.—London *Electrician*, July 4, 1913.

Joining Tungsten to Copper.—A note on a recent British patent (10,338, 1912) of the British Thomson-Houston Company and the General Electric Company of this country. The copper is purified by treating at a temperature considerably above its melting point with an oxidizing boron compound, and then melted or cast in contact with the tungsten.—London *Elec. Eng'ing*, July 10, 1913.

Generation, Transmission and Distribution

Distribution of Energy Over Extended Districts.—G. Klingenberg.—A continuation of his illustrated paper on the fundamental principles of distribution of electrical energy over extended districts. In the present instalment the design of the insulators, pole construction and other details of transmission lines are discussed.—*Elek. Zeit.*, July 3, 1913.

Corona Losses.—Goerges.—An abstract of a paper read before the Dresden Electrical Society on the principles and the measurement of corona losses. In the Lauchhammer-Riesa-Groeba three-phase line, consisting of three seven-strand cables, each of 6 sq. mm, the corona losses are 2.2 kw per kilometer at 100,000 volts and 8.5 kw per kilometer at 110,000 volts. Experimental measurements of corona losses in an artificial high-tension line have been made and are being continued in the electrical laboratory of the Institute of Technology of Dresden.—*Elek. Zeit.*, July 3, 1913.

Rolling Mill.—C. Hahn.—A long illustrated article on a reversible rolling mill arranged according to the Ilgner-Leonard principle. The results of extended careful tests of energy consumption are given.—*Elek. Zeit.*, July 3 and 10, 1913.

Traction

Multiple-Unit Control.—An illustrated account of the Thury system of control for multiple-unit trains. The normal controllers on the different cars are utilized and their simultaneous action is obtained by means of small electric motors wound for a low pressure. Regulators are employed which work the controllers, and the current from a battery of about eighteen cells is used. These regulators are placed on the platforms of the coaches. The number of conductors between coaches is only three; they carry small currents of about 1.6 amp, and the pressure between conductors and earth is only from 36 volts to 46 volts. The system is being used in France.—London *Electrician*, July 4, 1913.

Electric Vehicles.—D. S. Martin.—An article on further progress in the development of the electric vehicle business in the United States.—London *Elec. Review*, July 11, 1913.

Installations, Systems and Appliances

Oil Engines in Small Central Stations.—An illustrated description of the Epsom electricity works in England, where two small steam sets of 35 kw and 75 kw have recently been replaced by a Diesel engine of 300 hp. The exhaust gases from the engine pass into the flue of one of the existing steam boilers. This boiler is of the dry-back semi-marine type and has an evaporative capacity of 6000 lb. per hour with cold feed. With the Diesel engine running at about three-quarters load, sufficient heat is obtained from the exhaust gases which leave the cylinder at about 750 deg. Fahr. to evaporate 500 lb. or 600 lb. per hour, and to keep steam at a pressure of about 50 lb. per square inch. —London *Electrician*, July 11, 1913.

Wires, Wiring and Conduits

Laying Single-Phase Mains in Iron Pipes.—L. Bloch.—A translation in abstract of the author's recent German paper in which he points out that when single-phase cables are laid singly in iron pipes serious troubles are likely to arise if the currents exceed 50 amp, and even at lower limits. The most notable effect is seen in a rise in temperature, added to which the voltage drops and the loss in watts may have a serious effect on the satisfactory working of the installation.—London *Electrician*, July 4, 1913.

Submarine Power Transmission Cable.—An illustrated

article on two submarine high-tension cables laid from the Stralsund power station in Germany through Stralsund Bay to the island of Ruegen. The working pressure is 15,000 volts, the copper cross-section 3 sq. mm by 35 sq. mm; the number of cores three; the insulation impregnated paper; the protection lead sheathing and armor of round iron wires. The cable is in two sections of 335 m and 1350 m respectively. After laying the Stralsund-Ruegen cable, two cables, each 430 m in length, of the same design were installed from the Wittow Ferry to the peninsula of Wittow on the island of Ruegen. The laying of these cables is described in some detail.—London *Elec. Review,* July 11, 1913.

Electrophysics and Magnetism

Radiation Pressure.—GILBERT D. WEST.—An abstract of a (British) Physical Society paper. The pressure of the radiation emitted by a carbon-filament lamp at a distance of a few centimeters is sufficient to cause a microscopically measurable deflection of the end of a suspended strip of gold or aluminum foil, and by this means the radiation pressure can be calculated, knowing the weight of the strip. The results agree to within about 10 per cent with the energy content per cubic centimeter as measured by the initial rate of rise of temperature of a copper plate exposed to the radiation. The best results are obtained by working in an atmosphere of hydrogen of 1 cm to 2 cm pressure, but good results are obtained with hydrogen at atmospheric pressure. Air at 1 cm to 2 cm pressure also gives good results. The method involves no laborious adjustments, and the apparatus is not seriously affected by vibration.—London *Electrician,* July 4, 1913.

Tinfoil Contact with Dielectrics.—G. E. BAIRSTO.—An abstract of a (British) Physical Society paper in which the author describes some experiments showing how the accuracy of the different kinds of electrical measurements made on condensers is influenced by the use of imperfect tinfoil contacts.—London *Electrician,* July 4, 1913.

Electrochemistry and Batteries

Pinch-Effect Furnace.—CARL HERING.—An illustrated abstract of his Faraday Society lecture in which he demonstrated his pinch-effect furnace with a small model used for melting lead and showing the rapid circulation of the molten lead.—London *Elec. Review,* July 11, 1913.

Units, Measurements, and Instruments

Cable Testing Plant.—LEON LICHTENSTEIN.—A profusely illustrated description of the laboratory and testing plant of the new cable works of the Siemens-Schuckert Company. For the testing of the cables a 40,000-volt testing plant and an 80,000-volt testing plant are provided, while space is left for a 120,000-volt plant to be erected later. The high-tension laboratory contains two transformers, one for 400,000 and the other for 200,000 volts with accessories. The equipment of the testing plant and the laboratory is described in detail and profusely illustrated.—*Elek. Kraftbet. u. Bahnen.* June 4, 1913.

Effect of Selenium as a Detector of Light.—E. E. FOURNIER D'ALBE.—A brief note on a recent Royal Society paper. The author remarks that the efficiency of a selenium preparation used as a detector of light is defined as the amount of additional conductivity imparted to it by the unit of incident light. It is best stated in "micromhos" per lumen. Since many factors affect the efficiency of a given selenium bridge, standard conditions are chosen, chief among them being an illumination of one lux. The law of light action is studied, and the total effect is shown to be proportional to the square root of the incident energy, while the instantaneous effect is proportional to the energy. This is verified down to an illumination of 0.00001 meter-candle. It is shown that selenium is the most efficient light detector known, that it is capable of discriminating minute differences of luminous intensity far beyond the capacity of the eye, and that with suitable means of detecting minute currents, it should offer a means of testing the quanta theory of light by direct experiment.—London *Electrician,* July 11, 1913.

Precision Resistors.—K. W. WAGNER AND A. WERTHEIMER.—The conclusion of their illustrated paper on the construction of precision resistors for high-frequency alternating current at the Reichsanstalt. The authors show how the time constants of the resistors can be reduced to a small fraction of their former value by a suitable arrangement of the winding. In the present instalment they give details of construction of coils for 700 ohms, 200, 100, 70, 20, 10, 1.0, 0.1 and 0.10 ohms.—*Elek Zeit.,* June 5,1913.

Ballistic Galvanometer.—T. J. I'A. BROMWICH.—The author gives the mathematical theory of the oscillations of the needle in a ballistic galvanometer and shows that the usual formula is only approximate; a more exact formula is given by the author.—*Philos. Mag.,* July, 1913.

Calculation of Electromagnets.—G. SCHLEE.—In a continuation of his serial on electromechanical calculations the author gives an outline of the calculation of electromagnets with a numerical illustration.—*Zeit. f. Feinmechanik,* April 5, 1913.

Oscillographic Demonstrations of Damped Oscillations.—G. MELLER AND M. POZARYSKI.—An illustrated description of a method of demonstrating in the lecture room damped oscillations by means of the oscillograph. Curves are given of condenser discharges and of the damped oscillations in two coupled circuits.—*Elek. Zeit.,* June 19, 1913.

Telegraphy, Telephony and Signals

French Wireless Telègraphy Apparatus.—An illustrated description of various French wireless telegraph apparatus shown at the Eiffel Tower at the recent visit of the (British) Institution of Electrical Engineers to Paris. The Magunna oscillating-current generator is first described. The Magunna generator is based on the employment of tuning forks, which are kept in continuous vibration like the interrupter of an induction coil. These electrical tuning forks in the present case are used as a converter of continuous into oscillating isochronous current, and have so far been improved that they are now capable of breaking and converting a continuous current of 5 amp at 220 volts into alternating current of a frequency of about 375 cycles which remains quite constant. The tuning fork is kept in continuous vibration by putting one of its branches in contact with a belt, which runs, as it were, against the edge of the prong-end so that it is displaced. For this purpose two pulleys, driven by vertical shafts, carry an endless belt and are driven by a 0.025-hp electric motor. A tuning fork fixed rigidly on a support is placed in contact with the belt

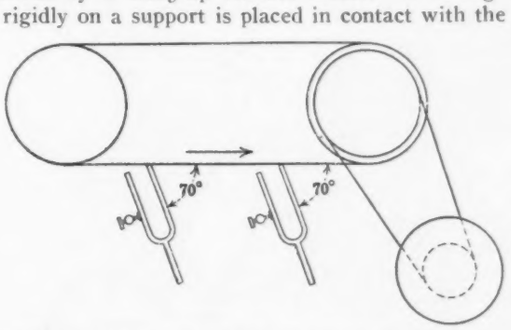


FIG. 4—TUNING FORK IN CONTACT WITH BELT

when it is at rest as shown in Fig. 4. The tension of the belt may be regulated by displacing one of the pulleys. When the belt is in movement the tuning fork begins to vibrate, making and breaking contact on the free leg, as shown in the diagram. The tuning fork, the primary of the transformer and the Morse key are connected in series to the terminals of the generator. A condenser is bridged

across the terminals of the vibrator, and so suppresses the spark at the moment of breaking. The frequency of the current thus obtained is equal to that of the tuning fork, and is, moreover, rigorously constant and independent of the speed of the belt. The standard type of this apparatus gives two frequencies, namely, 320 cycles and 380 cycles, the frequency of the note being double. One or the other of these

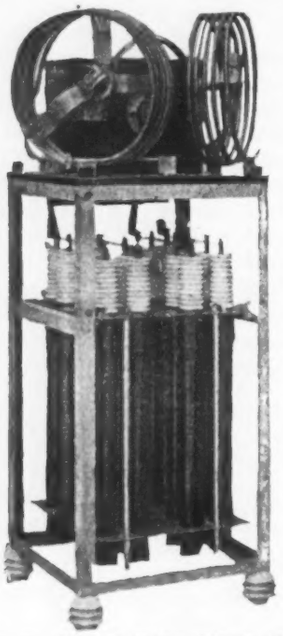


FIG. 5—SINGLE-WAVE OSCILLATOR

two notes can be obtained by simply altering a single-pole switch. The system of the Société Française Radio-Télégraphique, in use at the Eiffel Tower, is next described. One of the essential points of the system is what is termed a single-wave oscillator. The ordinary methods of coupling give rise to two waves in the antenna, and these can only be reduced to a single wave by weakening the coupling to an impracticable extent. The oscillator that is used consists of the primary and secondary windings set at right angles to one another as seen in the illustration, Fig. 5, the two windings being connected together rigidly. It is claimed that by this arrangement the whole system oscillates with a single frequency whatever the degree of coupling.—London *Electrician*, July 11, 1913.

Printing Telegraph.—An illustrated article on the new Siemens automatic high-speed printing telegraph which is a machine telegraph with automatic tape transmission. —London *Electrician*, July 11, 1913.

Telephone Exchange.—K. Buttler.—An illustrated description of the equipment of the new telephone exchange "Wilhelm" in Charlottenburg near Berlin. The central-battery system with Ericson connections is employed.—*Elek. Zeit.*, June 26 and July 3, 1913.

Miscellaneous

Kelvin Memorial.—Notes on the Kelvin memorial in Westminster Abbey, where the Kelvin window is to be dedicated. This memorial has been subscribed for by British and American engineers.—London *Electrician*, July 11, 1913.

Electric Accidents.—An account of the annual report by G. Scott Ram, the electrical inspector of factories in Great Britain. From a table of accidents in British electric stations and substations in 1912 it appears that there were 371 non-electrical accidents, of which eleven were fatal, and seventy-four electrical accidents, of which four were fatal. In factories other than electrical stations there were 283 accidents, of which fifteen were fatal. The reasons of the different electrical accidents are analyzed. Of the eighteen fatalities directly due to electric shock, five were on high-pressure or extra-high-pressure alternating-current systems. Ten were on medium-pressure alternating systems; six of these were from shock to earth on three-phase systems of which the pressure between phases was 440 volts or less, and, as the neutral point was earthed in probably each case, the pressure received would not exceed 350 volts in any instance. One was from a 200-volt single-phase system. Of the two on direct-current systems, one was on a 460-volt three-wire system, but not having the middle wire earthed, and the other on a 220-volt two-wire system. In only nine cases is it clear that any attempt was made to resuscitate the victim by means of artificial respiration. In several it certainly was not attempted. The inspector emphasizes the importance of resorting to artificial respiration immediately and not desisting even should a doctor pronounce the victim to be dead.—London *Electrician*, July 4, 1913.

Electric Shock.—H. Gerbis.—A paper on the effect of electric shock on the human body, with advice as to the first help in case of electrical accidents.—*Elek. Zeit.*, July 3, 1913.

Book Reviews

Engineering Valuation of Public Utilities and Factories. By Horatio A. Foster. New York: D. Van Nostrand Company. 332 pages. Price, $3.

An excellent treatise on theory and practice in the making of engineering valuations, as applied to public utilities, railroads and industries. The author appears to have been inspired by an effort to present both sides of controversial questions. There are fifteen chapters, dealing with definitions of value, purposes of valuation, directions and instructions for valuing tangible property, numerous forms for use in such work, cost of valuation, good will and going value, depreciation, amortization, handling depreciation funds, appreciation, franchises, capitalization, public utility control, court decisions and a short bibliography. The chapter on forms will be very helpful to engineers in this field of work. Perhaps the chapter on depreciation is the most noteworthy of all, especially in its quotation of depreciation rates allowed by various authorities. Among the leading decisions presented are the Consolidated Gas case, the Knoxville Water case, and the Kansas City Waterworks case, which are given in full.

The Regulation of Municipal Utilities. Edited by Clyde Lyndon King. New York: D. Appleton & Company. 391 pages. Price, $1.50.

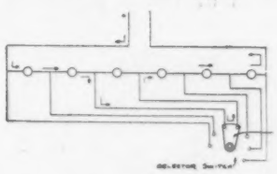
A collection of monographs on utility regulation by numerous authorities, with introductory discussions by the editor, forming an addition to the National Municipal League Series. Some fifteen papers are classed under three divisions—regulation through franchise, through municipal commissions, and through state commissions. In discussing first the question of municipal ownership versus regulation, the editor argues that the tendency toward the former should be checked only in case thorough-going regulation is accepted. The chapter on conclusions recommends the creation of public utility commissions with full and complete regulative powers, that such commissions be isolated and conspicuously responsible, that such commissions be state-wide and supplemented in large cities by subordinate urban commissions, that franchises should be very carefully drawn so as to conserve the public interest and authority, and that provision should be included for municipal ownership and operation in new regulatory laws. Regarded from the broad standpoint of public welfare the main conclusions seem to be sound, particularly the view that municipal operation is an acceptable alternative only in the event that regulation proves a signal failure.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Selector Switch for Restoring Series Circuits

In a series circuit such as used for street-car lighting if one lamp burns out the whole series is left in darkness. To find which lamp is burned out it is usually necessary to test out successively each lamp and socket until the right one is found. The selector switch illustrated herewith solves the

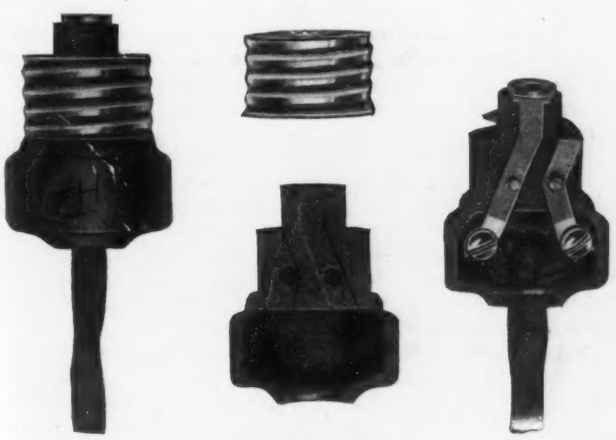


WIRING DIAGRAM FOR SERIES LAMPS

difficulty by quickly throwing into circuit a sixth lamp to take the place of the one burned out. The only manipulation required is the turning of a knob until the lamps light. The selector switch "feels" for the difficulty and immediately remedies it. A device of this kind is especially applicable with the modern tendency toward the use of a single circuit of large-size high-efficiency units for car lighting. The switch described is made by the Nichols-Lintern Company, 8404 Lorain Avenue, Cleveland, Ohio.

Split Attachment Plug

The saving of time in wiring the split attachment plug now being marketed by the Cutler-Hammer Manufacturing Company, Milwaukee, is of importance to the manufacturer using many plugs with his product. While having the appearance of a solid plug, this device separates into halves to facilitate wiring. Removing the screw shell of the plug



DETAILS OF PLUG

allows it to be separated into two halves, thereby exposing the binding screws for securing the cord. Unlike solid plugs there is a large space for the knot. The bottom of the screw shell has a large number of crescent-shaped perforations, one of which when the shell is screwed in place engages with a latch, securely locking the shell in place, preventing it from being turned backward and holding the plug halves together. A friction-wiping contact independent of the locking latch makes electrical connection with the screw shell.

The plug is sent out with the screw shell in place but not locked so that it is only necessary to unscrew the shell and wire the plug, after which the halves are placed together and the shell screwed on until locked. If it is desired to unlock it at any time, a penknife or screwdriver can be used to press down the latch to permit unscrewing the shell.

Black heat-resisting thermoplax is used for the body of the plug. The smallness of the plug makes it at once suitable for a great variety of uses for which separable cap plugs are not required. A reducing bushing is provided so that ordinary, reinforced or silk cord may be used.

A Telephonic Fire-Alarm System

Ephrata, Pa., a thriving industrial community of approximately 4000 inhabitants, recently completed the installation of a telephonic fire-alarm system. The equipment consists of eighteen fire-alarm telephone stations and a switchboard for headquarters. The telephones are of the iron-box type with double-door construction, especially adapted to out-of-door service. The outer door is kept locked and contains a key placed behind a glass window, which must be broken before the key can be removed and the door opened. The outer door protects the talking apparatus and when opened exposes to view only the receiver and transmitter. These instruments in turn are mounted on an inner door, which can be opened only by a special key and protects the auxiliary apparatus. This double-door construction, combined with the thorough moisture-proofing treatment given to the various metal parts and pieces of apparatus, renders the telephone dust-proof, moisture-proof and weather-proof.

The switchboard is of the sectional-unit lamp-signal type, operating from a central battery. The present board is arranged for a maximum of twenty stations, but as the

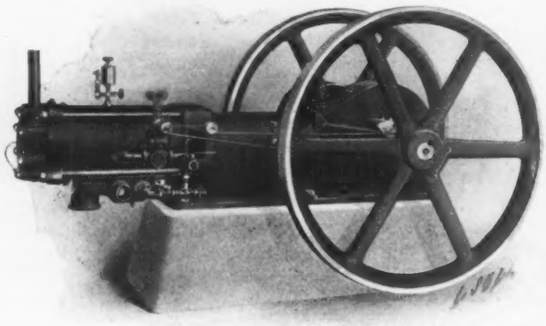
OUT-DOOR TELEPHONE STATION

number of these increases new line sections may be added. When an alarm is sent in and the telephone receiver at the first-alarm station taken off the hook, a lamp, which is numbered to correspond with the station, lights in the face of the switchboard and indicates which box is calling. Associated with all the line signals is a 12-in. gong, which starts ringing whenever one of the signal lamps lights.

As it may happen that the person sending in the alarm becomes too excited to give explicit directions, or else hangs up the receiver without having given any directions at all, the circuits are arranged so that the lamp signal remains lighted and the gong continues to ring until the switchboard attendant plugs into the jack associated with the line lamp, thus extinguishing the lamp and stopping the gong. This circuit arrangement makes it possible for the attendant to know at all times which box has called. The telephones and switchboard were furnished by the Western Electric Company, Chicago, Ill.

Valveless Gas Engine

Realizing that a large percentage of gas-engine troubles can be traced to the valves, the Producers' Supply Company, of Franklin, Pa., has developed a valveless gas engine. The cylinders of this engine are the three-port type and are made heavy enough to withstand several reborings. Trunk-type pistons with an improved design of piston ring are used. The throttling governor shown in the accompanying illustration is belt-driven and is provided with a device in the shape of an idler pulley and lever which will throttle the gas supply and stop the engine in case the governor belt should break. The engine may be equipped with either electric or hot-tube ignition, but the manufacturer recommends the electric ignition as much more reliable and safe than the other system.



VALVELESS GAS ENGINE

Lighting the Modern Circus

Open-flame gasoline torches or gas lamps have lighted circuses for many years, but this season two of the largest tent shows in the world, those of Barnum & Bailey and Ringling Brothers, have their own power plants for lighting the main and smaller tents by electricity.

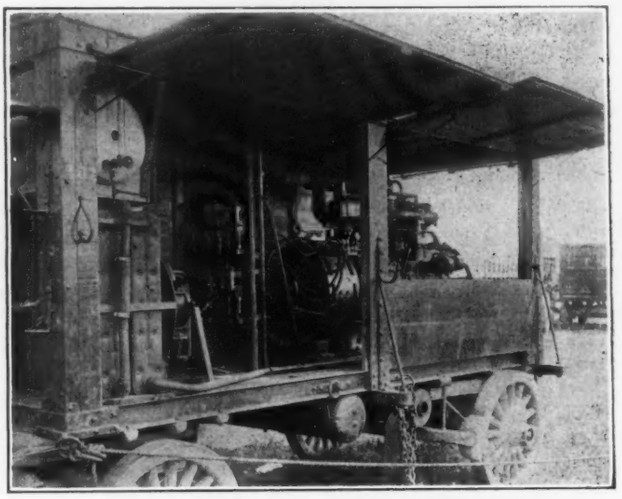
The apparatus consists of portable gasoline-electric sets manufactured by the General Electric Company specially for the purpose. The units are carried in duplicate so that if one should by any chance become disabled while en route the other can supply energy for half the lamps. The units are arranged, however, to operate regularly in multiple, each set furnishing energy for eighteen arc lamps. Two 25-amp spot-lamps for the stage and several strings of incandescent lamps are also operated from the plants in each instance. A third supply wagon used for a workshop is equipped with a powerful electric search-lantern mounted on top, which is directed to different parts of the grounds while taking down tents and loading after the evening performance.

The outfits are very compactly built and are readily portable. They are mounted on one of the ordinary inclosed circus wagons, about 18 ft. long and 7 ft. wide, with the ends and sides of the truck body removable. Each unit is composed of a 25-kw, 125-volt compound-wound, direct-current generator, which is built integral with the frame and directly connected to the shaft of a four-cylinder 560-r.p.m. throttle-governed, vertical gasoline engine.

The set is installed on the rear of the wagon with the flywheel at the outer end. The switchboard for controlling the current is located about 2 ft. from the generator end of the unit. The switchboard is of the slate-panel type with main and feeder switches, instruments, rheostats, etc.

Ignition is effected by a low-tension, automobile-type magneto and induction coil, with an auxiliary battery for starting. The governor is very sensitive and responds quickly to changes in load. It limits the speed variation of the engine from no load to full load within 4 per cent, which with the type of generator employed insures constant voltage. Adequate lubrication is secured by forced circulation from an oil pump.

The generator is of the multipolar continuous-current type designed especially to meet the characteristics of the engine to which it is connected. The field winding is compounded and compensates for the drop in engine speed between no load and full load, thereby maintaining a constant voltage throughout the entire range of operation. All similar parts of these outfits are built so that they are readily interchangeable in so far as is mechanically practicable, which allows replacing with renewals without tedious fitting.

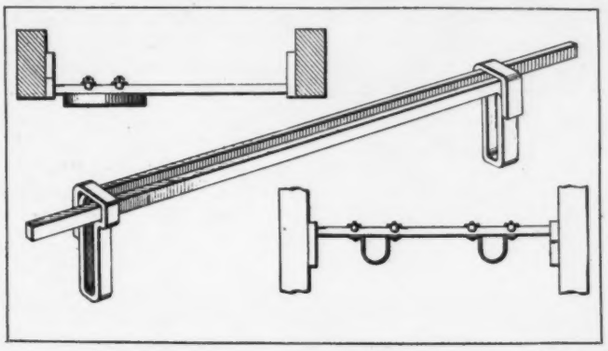


LIGHTING OUTFIT ON CIRCUS WAGON

Adjustable Construction Cleats for Interior Wiring

The accompanying illustrations show a device which can be used to support ceiling outlet plates, wall outlets, brackets, switch boxes and conduits in buildings no matter what the spacing of the floor joists and studdings may be. The construction cleat, as it is called by the manufacturers, consists of two bars of rectangular steel bent into the shapes shown and arranged so that they can slide past each other, making an extensible cleat. The center illustration shows the cleat in the position in which it would be placed to be hung over two floor joists. The legs are to be placed between the joists with the extensions resting on the top of the joists and supporting the weight of the ceiling outlet or fixture. When placed in this position nails are driven through the legs into the joists. To secure the ceiling plate to the cleat, bolts are passed through the ceiling plate, between the parallel bars, and fastened to clamps on the upper side of the cleat as shown in the upper illustration. U-shaped clamps for supporting the conduit may be secured to the cleats in the same manner as shown in the lower corner of the illustration.

Saving in the time of installing electrical equipment is the main advantage of using this type of cleat. Where the old method of fitting a 2-in. by 4-in. timber between joists and studdings is used, it is asserted that the cost of installing can be cut in half with a slight investment in these



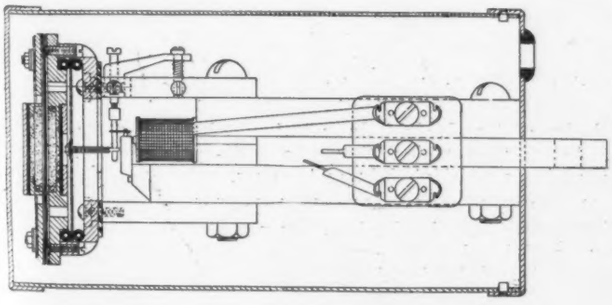
ADJUSTABLE CONSTRUCTION CLEATS

cleats. The device is manufactured by Alex. M. Knauber & Company, of Chicago, and is sold by the Inland Electric Company, of the same city.

Loud-Speaking Telephone Enunciators in Baseball Grand Stand

An interesting trial installation of loud-speaking telephones, which may be made a permanent feature, has been made in the Comiskey Baseball Park in Chicago. It consists of a number of the recently developed telephone enunciators known as "musolaphones" and installed by the Chicago Musolaphone Company. The reproducers of this system are incased in horns or resonators suspended over both tiers of seats in the grand stand. Ultimately about 175 of these reproducers will be installed and about half of that number are in use now.

By means of this system the announcement of the batteries of the baseball teams, changes in the line-up, or other announcements, may be made to the assembled audience. There is one transmitter booth where the operator sits, and an "amplifier," to build up the tone, is used for each five reproducers. Before the game begins the system is utilized to transmit phonographic music from a Victor record. The "music" is rather harsh and not particularly pleasant, but the speaking announcements are clear and effective. The musolaphone people say that the "music" could be toned down by introducing more resistance into the circuit.



AMPLIFIER USED TO ENERGIZE REPRODUCERS

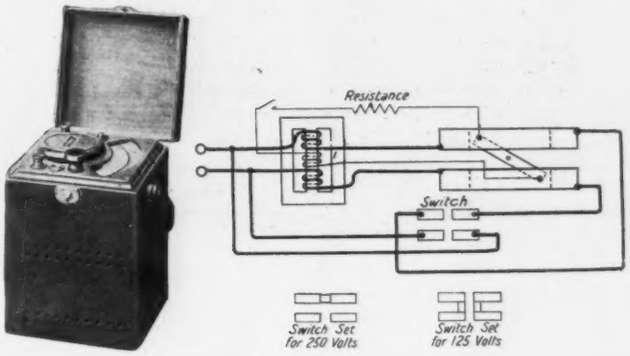
The musolaphone is said to be adapted for announcing bargain sales to department-store throngs, giving fire alarms in crowded factories, announcing the departure of trains in railroad stations or varied purposes of like nature. It can also be connected with a commercial telephone service to transmit music to subscribers. An interesting fact, and one which does not seem to be clearly understood, is that where a quartet is singing in the studio or transmitting booth a better effect is obtained if a separate transmitter and an individual source of electricity are used for each performer. A motor-generator set, consisting of a motor and four small direct-current generators, has been devised for this purpose.

Iron-Loss Voltmeter

An iron-loss voltmeter for use in connection with a wattmeter for determining the iron loss in transformers on the basis of sine-wave voltage and normal frequency, when the testing is done on a circuit of any wave-shape and frequency approximately normal, has been developed by the Westinghouse Electric & Manufacturing Company.

The iron loss in a transformer varies with the wave-shape and frequency. Guarantees are, therefore, based on sine wave and a normal frequency, but the standard conditions are difficult to obtain in practice. However, for any other wave-shape and frequency there is some equivalent voltage that will produce the same iron loss as would the sine wave of normal frequency at normal voltage. The iron-loss voltmeter enables the tester to adjust to this equivalent voltage for the circuit at hand.

The iron-loss voltmeter consists of a moving element of a wattmeter in series with the winding on an iron core as shown in Fig. 2. With this connection the meter element measures the energy loss in the iron core. The scale is



FIGS. 1 AND 2—IRON-LOSS VOLTMETER AND WIRING DIAGRAM

calibrated on a circuit of sine-wave voltage and is marked in volts. Any circuit that makes the instrument read a certain "voltage," therefore, produces the same iron loss as would a pure sine wave of that voltage. If the voltage or frequency of the circuit on which a transformer test is being made is adjusted until the iron-loss voltmeter indicates the rated sine-wave voltage of the transformer being tested, the iron losses in the transformer will be the same as they would be on a circuit of that voltage and sine-wave shape. The instrument does not indicate the voltage of the circuit, but the voltage of a pure sine wave of normal frequency that would cause the same iron loss in the transformer as the wave of voltage of the testing circuit. There is also a watt scale marked on the meter which indicates the total watts consumed in the meter. This is for the correction of wattmeter readings taken when the voltmeter is in circuit.

In application, the iron-loss voltmeter is connected across the terminals of the transformer under test in the same manner as an ordinary voltmeter. A wattmeter is also connected in the circuit in such a way as to measure the total input of both the transformer and the iron-loss voltmeter. The voltage of the circuit is then adjusted by any convenient means until the voltmeter reads the normal voltage of the transformer. The total power input is read on the wattmeter and the watts input of the instrument is read on the watt scale of the iron-loss voltmeter, the difference being the loss in the transformer.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Boiler Equipment for Soap Company.—The Procter & Gamble Company is adding to the boiler equipment of its plants at Ivorydale, Ohio, and Port Ivory, N. Y., a total of about 5200 hp of Babcock & Wilcox boilers.

Additional Equipment for a Cleveland Utility.—The Cleveland Electric Illuminating Company, of Cleveland, Ohio, is installing at the present time a 15,000-kw Curtis General Electric turbo-generator unit with 4800 hp of Babcock & Wilcox boilers and auxiliary pump and condenser equipment.

New Holder Coming Out.—The Plinne & Atwood Manufacturing Company, 30 East Forty-second Street, New York, is to put on the market shortly a new type of screwless socket and globe holder. The device can be used without tools and can be quickly and easily operated. It provides a good grip on the globe without danger of cracking it.

Turbine Wheel for Niagara Falls.—The Hydraulic Power Company of Niagara Falls, N. Y., has just awarded to the F. P. Morris Company, of Philadelphia, Pa., the contract for a 10,000-hp turbine wheel to operate under a 210-ft. head at 300 r.p.m in Station No. 3. This is the fourteenth unit of this same type and size furnished by the Morris company for this project.

Bridgeport Utility Growing.—The United Illuminating Company, of Bridgeport, Conn., is increasing its plant at the present time. Additions have been made to some of its buildings and five 600-hp Babcock & Wilcox boilers with Taylor stokers have been installed, together with three 2500-kva steam turbo-generator sets and four 500-kw motor-generator sets, the latter for substation work.

Ohio Battery Company Bought Up.—The Manhattan Electrical Supply Company has purchased the business and plant of the Rock Island Battery Company, of Cincinnati, of which it took possession on Aug. 1. This move will not mean the discontinuance of the Rock Island dry battery, for this battery will be made in addition to the "Red Seal," "Hi-Up," "Blue Seal" and "Mesco" batteries, now manufactured by the former concern.

Wagner Electric Manufacturing Company.—The Dallas (Tex.) office of the Wagner Electric Manufacturing Company has been merged with the Kansas City office of the company, at 1115 Gloyd Building. Mr. P. Loyd Lewis, who has heretofore been Texas representative, will become Kansas City manager, and Mr. J. A. Gelzer, who has been the Kansas City manager, becomes manager of the company's service department, with headquarters in St. Louis. Mr. Lewis personally will continue to cover the Texas territory.

Hydraulic Turbine Order Placed.—Boving & Company of Canada, Ltd., who have recently acquired works at Lindsay, Ontario, for manufacturing high-class hydraulic machinery, have had awarded to them by the Hydro-Electric Power Commission of Ontario the contract for large turbines and governors for the Wasdells Falls development on the Severn River. These units will be of similar size to those recently supplied by Boving & Company for Dams Nos. 2 and 5 on the Trent River, which have a combined capacity of 10,000 hp.

National Tube Company Enters Electrical Conduit Field.—On Aug. 1 the National Tube Company, of Pittsburgh, Pa., entered the electrical field with its line of wrought-iron conduits for electric-wiring service. This concern has contracted with the National Metal Molding Company and the Safety Armorite Conduit Company, both of the above city, to manufacture and merchandise this product under their several brands, and the sales will be put on the "Pittsburgh basing discount" plan, by which all wrought pipe for other purposes has been sold for the past thirteen years.

Hot Point Company to Build a Canadian Factory.—Because of the tariff restrictions which, they claim, almost prohibit the exportation of electrical heating apparatus from the United States to Canada, the Hot Point Electric Heating Company, which now has its central plant at Ontario, Cal., will immediately build a large branch manufacturing plant at Toronto, Canada. Announcement to this effect was made July 25 by Willis Booth, president of the company. Mr. Booth said that this Canadian plant would cost about $250,000 and would employ between 150 and 200 persons.

Ornamental Bronze Standards for New York Parkway.—An order for ten reinforced fluted bronze columns of Ionic design has been obtained from the city of New York by the Union Metal Manufacturing Company, of 30 Church Street, New York. These columns will each support a single large globe containing tungsten lamps and will be placed along a large concrete stairway on 215th Street, near the Hudson River. The company recently supplied a number of ornamental three-lamp standards for use in the City Hall Park at Perth Amboy, N. J., and it states that this equipment is giving entire satisfaction.

Canadian Expansion of the Sturtevant Company.—The B. F. Sturtevant Company, of Hyde Park, Mass., which is controlled by Governor Foss of that State, has recently acquired the plant of the Canadian Motors Company, at Galt, Ontario, and is preparing to establish there a Canadian branch to handle the large volume of business which it has in the Dominion. The company has taken out a Canadian charter under which these operations will be carried on. The principal reason for establishing a factory in Canada is said to be the desire to escape paying tariff on product shipped across the border, and this action is therefore a direct result of the failure of the Canadian reciprocity measure during the last administration.

Some Recent De La Vergne Sales.—The type "F H" oil engine made by the De La Vergne Machine Company, of New York, is enjoying a good degree of popularity. The Electra (Tex.) Electric Company has just purchased one of these engines of 100-hp rating, which will drive a 62½-kw, three-phase, 60-cycle, 2300-volt alternator for municipal power and lighting. Four 60-hp engines of the same type have just been bought by the Marconi Wireless Telegraph Company of America to be installed in its receiving stations, one at Belmar, N. J., one at San Francisco, Cal., and two at Honolulu, H. I. Another firm which has recently bought this type of engine is the Des Moines Bridge & Iron Works, of Des Moines, Ia., which obtained a 60-hp unit to be belted to a 50-kw, three-phase, 60-cycle generator for supplying municipal light and power.

Recent Stoker Sales.—The Laclede-Christy Clay Products Company, of St. Louis, Mo., has recently closed contracts for supplying its chain-grate stokers to the University of Missouri, at Columbia, Mo., and to the Kentucky Distilleries & Warehouse Company, of Louisville, Ky. The former installation consists of equipment for two 350-hp and one 250-hp boiler, and in the latter cases there are four 460-hp boilers. The company prides itself on the number of institutions of learning in which its product has been used, among recent buyers being the University of Minnesota, Minneapolis, Minn.; the Christian University, Canton, Mo.; the Bradley Polytechnical Institute, Peoria, Ill.; the Memphis High School, Memphis, Tenn.; the Indiana University, Bloomington, Ind., and the Carter H. Harrison Technical High School, Chicago.

Newspaper Electric-Service Enterprise.—The Inter Ocean Newspaper Company, of 57 West Monroe Street, Chicago, is seeking permission from the City Council to transfer its electric-service business to a new company, to be known as the Inter Ocean Light & Power Company. The Inter Ocean company supplies electrical energy and steam to buildings in the block in which it is located, and as it uses streets and alleys for that purpose it operates under a contract ordinance granted by the City Council. It is planned to have a separate company handle this business.

Electrical Equipment for a Boston Industry.—The Boston Woven Hose & Rubber Company has just completed the construction of a new mill and power plant at its factory, the first mentioned being of reinforced concrete in keeping with its other mill buildings, and the other being of brick. The power plant equipment was installed by the Stone & Webster Engineering Corporation, of Boston, Mass., and consists of six 600-hp Babcock & Wilcox boilers with Taylor stokers, and a Robins coal-conveying system. The latter feeds an overhead bunker of 500 tons capacity, from which the coal is fed to the hoppers by gravity. One 750-kw, two 1250-kw and one 2000-kw Westinghouse-Parsons turbine directly connected to three-phase, 60-cycle, 600-volt generators of the same make, supply the energy for driving the machinery in the entire factory (including the above-mentioned mill) and for lighting service. General Electric motors will be used for the individual and group drive in the mill building just finished.

Modern Telephone Service for Constantinople.—American-made instruments are to be largely used in equipping the modern telephone systems which it is expected will be put into operation shortly in Constantinople. The operating company is to be known as the Société Anonyme Ottomane des Téléphones de Constantinople, and is controlled by Anglo-American interests, including the Western Electric Company, British Insulated & Hellesly Cable Company, Thomson-Houston Company, of Paris, and the National Telephone Company. The service is planned to cover both the European and Asiatic sides of the Bosphorus, and include the Princess Islands in the Straits of Marmoras, about 10 miles from Constantinople. A thirty-year concession has been granted by the Turkish government to cover this work, and it is expected that the government will eventually purchase the system. About 2900 subscribers have been obtained to date, 25 per cent of whom are Turkish householders. A feature of particular interest is the fact that all operators will have to understand French, Turkish and Greek.

Status of the Edison Storage-Battery Business.—Mr. Edison recently called together a number of his storage-battery salesmen for a general personal report on trade conditions throughout the coutry and the formation of plans for next season's business. The remarkable increase in sales since Jan. 1—particularly in the types of battery used by manufacturers of delivery wagons and heavy motor trucks—brought out the fact that the alkaline nickel-iron cell is finding favor in this country. The orders for train-lighting outfits and signal service are far above normal. The business in house-lighting sets for country homes where central-station current is not available exceeds already that for any previous season and is increasing daily. Orders for ignition and lighting batteries on pleasure and commercial gas cars show a much larger percentage of "replacements" sold directly to the user. The electric commercial vehicle has established itself in practically every locality and climate, and data are available in all classes of service to furnish facts and figures on the best equipment for any individual installation.

Big Electrical Manufacturers Working to Capacity.—That the electrical industry at the present time is enjoying unprecedented prosperity is revealed by the fact that the calendar year 1913 will show more business transacted than ever. Orders have been received during the first half of this year in record-breaking volume by both the Westinghouse Electric & Manufacturing Company and the General Electric Company, the two biggest American manufacturers of electrical apparatus, and for the former concern the month of June produced the largest volume of business in its history. Nearly the same story can be told for the latter company, and the July business of both seems to promise even better. Some idea of what this means can be gained when it is stated that it is taking every bit of the working capital of the Westinghouse company to handle the increased production, while, as noted elsewhere in this issue, the General Electric Company has been forced to borrow in the neighborhood of $4,000,000 on short-term notes to meet these production expenses and has provided for the future sale of $6,000,000 more of these notes in anticipation of a continued period of activity. This large volume of orders is said to be in both cases well distributed and not due to the handling of any specially large individual enterprises. In view of the fact that the electrical industry is now at the height of prosperity, it would seem probable that conditions in other lines of industry are not so bad as many people are saying.

Harwood Electric Company Improves Plants.—Extensive improvements have been made recently by the Harwood Electric Company at three of its plants. An addition measuring 44 ft. by 47 ft. has been built to the substation at Hazleton, Pa., and new equipment installed consisting of Westinghouse 500-kw oil-insulated, self-cooled transformers, 11,000-4000 volts, and General Electric solenoid-operated switchboard of twenty-nine panels with type K automatic oil switches on high-tension incoming and outgoing lines and on the high-tension side of transformers. Hand-operated switches of the same type were placed in all feeder circuits. The main switchboard was completely equipped and includes, in addition to the above-mentioned, a totalizing panel. General Electric aluminum-cell lightning arresters with complete auxiliary equipment were placed on all high-tension lines and also on the feeder circuits. All lines enter and leave the station on steel towers. The station was also equipped with a sixty-cell storage battery for operating the switchboard and for emergency station lighting. The two 150-kw motor-generator sets now being installed each consist of two 75-kw direct-current generators directly connected, one to each end of the shaft of a 225-hp synchronous motor. The apparatus is mounted on a common bed-plate and is of Westinghouse make. At Freeland, Pa., a new two-story substation has been built, measuring 34 ft. by 64 ft., and the equipment here is similar to that at Hazleton, except that the switchboard is smaller. The municipal lighting contract in this town carries with it a proviso compelling the electric company to maintain and operate a fire-alarm system, and in this connection there was installed in this station an electrically driven air compressor, tanks and whistles for fire alarm. At Harwood, Pa., the company has recently put in a General Electric 6250-kva, 11,000-volt horizontal Curtis turbine generating set, operated condensing.

Reconstruction of a Michigan Generating Station.—Through R. K. Holland, electrical engineer with Gardner S. Williams, Ann Arbor, Mich., it is learned that a contract has been awarded to the Benjamin Douglas Company, Ford Building, Detroit, Mich., for the construction of a reinforced concrete spillway, waste gates and power house for the Argo plant of the Eastern Michigan Edison Company. This construction is located on the Huron River in the city of Ann Arbor, Mich., and is in fact the reconstruction of the present plant although the whole of the old work is being torn out. The spillway will support a footwalk and will be equipped with a manually operated flashboard mechanism. At the end of the spillway there will be a wasteway for taking care of excess flood water and for emptying the pond when desired. The power house will measure about 45 ft. x 95 ft. and will accommodate two vertical directly connected generating units, one a three-phase, 60-cycle, 2300-volt machine and the other a 450-kw, 600-volt direct-current generator, both driven by hydraulic turbines. The turbines, governors and thrust bearings are to be furnished by the Allis-Chalmers Manufacturing Company, of Milwaukee, Wis., while the generators, switchboards and switching gear will be of General Electric make. In the power house building there will be also two motor-generator sets of 500-kw rating each, for use on the street-railway load; also two banks of step-down transformers, 23,000-2300 volts, each bank consisting of three single-phase transformers of 333 kw each. The transformed energy is used for lighting the city of Ann Arbor and supplying power to the motor-generator sets for street-railway service. The

two directly connected units installed in this plant are connected up to the low-tension bus system and the street-railway system respectively. Transmission lines are to be brought into the transformer station from the Barton plant of the Eastern Michigan Edison Company, designed and constructed last year, and also from the Geddes and Superior stations of the same company.

Diesel Oil-Engine Plant Near St. Louis.—The Light & Development Company, of St. Louis, Mo., is erecting an isolated Diesel oil-engine generating plant in St. Louis County just west of the city to furnish electrical energy to the surrounding factory district. This station will be located on the Terminal Railroad Association's belt road, where oil can be shipped in cheaply, and it will replace a 50-hp gasoline engine-driven plant at present operated by the company in the same locality. The equipment of the new station will consist of two 100-kw, 300-volt, three-phase generators directly connected to Diesel oil engines running at 225 r.p.m. and operating on fuel oil. Belt-driven exciters are to be used. The district surrounding the station has excellent transportation facilities and land is cheap, so that it looks like a promising field for factory growth and an increased demand in the future for energy for electric drive.

Transformer Market Remains Favorable.—As evidence of the fact that the transformer business remains good the Moloney Electric Company, of St. Louis, Mo., cites an order calling for the shipment of five car-loads of transformers to South America and Spain. This sale comprised a large number of three-phase transformers ranging in rating from 100 kw to 300 kw and in voltage from 6600 to 33,000. All of these are of the oil-cooled type for interior use and will be shipped immediately. Another order of note recently placed with the same company is for eight transformers for use in the new Railway Exchange Building in St. Louis, the purchasers being in this case the Light & Development Company of the same address. Four of these latter are to be 300-kw units for stepping down the voltage of 4150 delivered to the building to 250-125 for lighting and elevator service. The other four will be auto-transformers, also of 300-kw rating and provided with 250-volt taps. These are also of the three-phase, oil-cooled type. It was stated by a representative of the Moloney company that while previously its business has been largely in units of small size there has been a marked demand of late for transformers of larger rating.

American Water Works & Guarantee Company to Pay Interest Due Aug. 1.—In response to requests for information from holders of securities of the American Water Works & Guarantee Company and its subsidiaries a statement has been issued by J. B. Van Wagner, treasurer of the company, to the effect that arrangements have been made for the payment of all interest maturing on Aug. 1 on securities of subsidiary companies.

Proposed Merger of Surface Street Railways in Chicago.—A sub-committee of five members of the local transportation committee of the City Council of Chicago has been appointed to reopen negotiations having for their object the merger of the surface street-railway companies of Chicago. The sub-committee will try to report to the full committee some time in October a plan by which a satisfactory proposal can be worked out. Negotiations on this subject were begun with the Chicago City Railway Company and the Chicago Railways Company some time ago, but were abandoned because the companies said that they must have a guaranteed return of 7 per cent on their investment. By the traction settlement ordinances of 1907, under which the companies are now working, they are guaranteed 5 per cent on the total valuation. After certain allowances are made for depreciation and other purposes the companies also receive 45 per cent of the "net divisible receipts."

False Rumors on Insull Stock.—Under the heading "English Investors Drop Insull Stocks," a Chicago daily newspaper said in a recent issue that "Large blocks of stock in Samuel Insull's utility companies, placed in London less than a year ago, have lately been unloaded on the Chicago market." In accounting for this alleged fact the newspaper writer continued: "Some think Mr. Insull, whose health appears to have broken under the strain, has undertaken to carry a load that is too heavy for him." This statement, which appears to have been also copied in New York and Boston financial papers, is evidently untrustworthy since Mr. Insull is enjoying excellent health. Moreover, the foreign holdings in Commonwealth Edison and Public Service Company of Northern Illinois stock are relatively inconsiderable, although of late foreign holdings have increased rather than diminished. In the Middle West Utilities Company perhaps 25 or 30 per cent of the stock is held by foreign owners. Commonwealth Edison stock has risen from 125½ to 141½ in the last few weeks, apparently on the strength of a rumor that the dividend rate will be increased from 7 to 8 per cent before the year is out.

General Electric Financing.—There is something more than extraordinary, during the present period of unrest and financial gloom, in the continued activity of the General Electric Company, which seems to be enjoying a floodtide of business while many other industries are suffering from a severe slump. The company is, in fact, so busy that it has been found necessary to make a note issue to help meet production expenses, and in this connection the following statement was recently given out by C. A. Coffin, chairman of the board of directors of the General Electric Company: "In September, 1912, the General Electric Company sold $10,000,000 of its forty-year 5 per cent debentures out of a total authorized amount of $60,000,000. At that time it was expected that the proceeds of these debentures would be sufficient to provide for the company's capital requirements until late in the present year. Owing, however, to an unprecedented increase in the company's business, this has not been the case, and in preference to issuing more debentures at this time the company is providing for its present needs by borrowing not exceeding $10,000,000 for eight or nine months at 6¼ per cent." It is rumored that between $3,000,000 and $4,000,00 of these notes have been bought by J. P. Morgan & Company, who, with Lee, Higginson & Company, have underwritten the issue.

Industrial Securities

Security	Capital Stock Listed	Dividend		Quotation	
		Per Cent	Period	July 23	July 30
Allis-Chalmers, t.r., 5th pd	$19,800,000	.....	.....	7½*	9*
Allis-Chal., pf.,t.r.,5th pd..	16,050,000	.....	.....	15	16½*
Amalgamated Copper.....	153,887,900	1¼	Q	69¼	69⅞
American Tel. & Tel.....	344,471,400	2	Q	128	128½
Electric Storage Battery,c.	16,074,425	1	Q	47⅜	48⅛
General Electric.....	101,363,600	2	Q	139¾	140*
Mackay Cos., c.....	41,380,400	1½	Q	77½*	77½
Mackay Cos., pf.....	50,000,000	1	Q	68*	69½*
Western Union Tel.....	99,747,600	¾	Q	63*	67½*
Westinghouse, E. & M., c.	34,496,400	1	Q	61½	63⅜
Westinghouse, E. & M., pf.	3,998,700	1¼	Q	110*	116*

*Last price quoted.

NEW YORK METAL MARKET PRICES

	July 22 Bid.	July 22 Asked.	July 29 Bid.	July 29 Asked.
Copper:				
Standard, spot*.....	14.00	.....	14.00	.....
	Selling Prices		Selling Prices	
	£ s d		£ s 4	
London, standard, spot*.....	64 8 9		65 15 0	
Prime Lake.....	14.50	to 14.60	15.00	to 15.10
Electrolytic.....	....	14.50	14.87½	to 15.00
Casting.....	14.25	to 14.35	14.70	to 14.80
Copper wire base.....	....	15.50	.....	16.00
Lead		4.35		4.50
Nickel.....	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f. o. b. smelter.....		7.00		7.25
Spelter, spot.....	....	5.40	....	5.60
Tin, spot*.....	41.00	to 41.50	40.80	to 41.00
Aluminum:				
Prompt delivery.....	23.00	to 23.50	23.00	to 23.50
Future.....	21.00	to 22.00	21.00	to 22.00

*OLD METALS

Heavy copper and wire.....	13.25	13.75
Brass, heavy.....	8.25	8.75
Brass, light.....	7.25	7.75
Lead, heavy.....	4.25	4.25
Zinc, scrap.....	4.25	4.25

*COPPER EXPORTS

Total tons to July 29.....25,621

*From daily transactions on the New York Metal Exchange.

Business Notes

The Standard Varnish Works, Chicago, announce that they have opened a branch house on the Pacific Coast at 113 Front Street, San Francisco, Cal., which is equipped with a large and complete stock of their architectural specialties, including Elastica No. 2, Elastica floor finish, Satinette white enamel and Kleartone stains. F. T. McHenry, who has represented the company on the Pacific Coast for many years, will be in charge of the new Western office.

Changes in Personnel of Baker Motor Vehicle Company.—At a directors' meeting held July 9, the Baker Motor Vehicle Company, of Cleveland, advanced George H. Kelly from the position of manager of the truck department to the office of secretary and sales director. R. C. Norton, heretofore secretary and treasurer, will continue as treasurer. E. J. Bartlett becomes sales manager of the truck department, and O. B. Henderson continues as sales manager of the pleasure-car department.

Goulds Manufacturing Company.—Mr. F. Z. Nedden, of London, Eng., has been appointed engineer in charge of the centrifugal-pump department of the Goulds Manufacturing Company, Seneca Falls, N. Y. Mr. Nedden was graduated from the technical university at Charlottenburg, Germany, and later served as assistant professor of gas and rotary engines at the technical university in Aix-la-Chapelle. He is the author of a textbook for engineering students which has been published in both German and English.

Steel City Electric Company.—In our issue dated July 12, on page 107, it was stated that the Steel City Electric Company, of Pittsburgh, Pa., had been incorporated and that Horace S. Gould was one of the incorporators. The company referred to was incorporated in 1904 and has an authorized capital stock of $35,000. The action referred to as a recent incorporation was in fact the filing of papers by the company in the office of the Secretary of State, at Albany, N. Y., and receiving by it of authority to transact business in the State of New York on July 2, 1913. Horace S. Gould, 37 Wall Street, New York, was designated as the person to receive process against the corporation in the State of New York.

New Industrial Companies

The National Electric Construction Company, of Kansas City, Mo., has been incorporated with a capital stock of $5,000 by H. P. Fisher, R. O. Wing and J. M. Deacy.

The Trinity Electraphone Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $100,000. The incorporators are: A. D. Jones, F. Lyster, of Philadelphia, Pa., and E. B. Waples, of Wilmington, Del.

The Beacon Miniature Electric Company, of New York, N. Y., has been incorporated by Leon Cooper, Abraham I. Wolf and Bernard Tauber, 56 West 112th Street, New York. The company is capitalized at $25,000 and proposes to deal in electrical supplies.

The Rothenbucher Equipment Company, of New York, N. Y., has been incorporated with a capital stock of $10,000 to manufacture and deal in engines, boilers and machinery. The incorporators are: George E. R. Rothenbucher, Alfred G. Tim and David Tim, 280 Broadway, New York.

The Wright Storage Battery Company, of Poughkeepsie, N. Y., has been incorporated with a capital stock of $100,000 to manufacture and deal in storage batteries. The incorporators are: Ralph H. Raphael, Marie F. Wainwright, R. H. Hammond, of 507 West 184th Street, New York.

The Hoppie Electrical Company, of Salt Lake City, Utah, has been incorporated with a capital stock of $500,000 for the purpose of manufacturing audiographs and telephone repeaters, which are the invention of William Hoppie. The officers of the company are: Curtis Hawley, president; L. S. May, vice-president, and Murray C. Godbe, secretary and treasurer.

Trade Publications

Clay Products.—The Laclede-Christy Clay Products Company, Manchester and Sulphur Avenues, St. Louis, is mailing large cards which tell of the infinite care used in the preparation of its products.

Automatic Voltage Regulators.—The General Electric Company has just issued an attractive 44-page bulletin, No. A4123, describing automatic voltage regulators for the regulation of generator voltage, for use with both alternating and direct current.

Porcelain Insulators.—Folder 4255 issued recently by the Westinghouse Electric & Manufacturing Company describes its type PG porcelain insulators. These are insulators with high mechanical strength, suitable for use on 1500-volt direct-current railway work and 2200-volt transmission lines.

Electricity in the Jewelry Industry.—In Circular No. 30,701 issued by the Holtzer-Cabot Electric Company, Boston, electricity in the jewelry industry is fully treated. A number of suggested electric drives for polishing, buffing and grinding are given, and various types of motors suitable for these classes of work are shown.

Air Brake Equipment.—Bulletin No. A4127 of the General Electric Company describes a straight and automatic air brake equipment for use on either single cars or trains of three or more cars. Cars provided with this equipment may be used as locomotives for switching service, and for operating interchangeably with steam railroad cars.

Window Searchlamps.—The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, issues a 16-page pamphlet referring to show-window searchlamps, in which is illustrated and described recent practice in lighting show windows. Illustrations are shown of some successful installations in which X-Ray window reflectors were used.

Insulators.—In Catalog No. 28 of the Hemingray Glass Company, Covington, Ky., are illustrated various types of insulators and their constructive features. The catalog contains fifty-four pages and has a striking cover. Each illustration is accompanied by brief information as to the weight per piece, approximate weight per 1000 packed and standard package quality.

Centrifugal Pumps.—Henry R. Worthington, 115 Broadway, New York, has issued an attractive 62-page catalog which illustrates and describes different types of volute centrifugal pumps. The volute pump derives its name from the form of casing, which is similar in shape to the involute curve. The catalog contains some useful tables, one showing the cost of pumping by electric energy.

Battery-Charging Switchboards and Motor-Generator Sets.—The Westinghouse Electric & Manufacturing Company has issued Descriptive Leaflet No. 3679, covering electric-vehicle battery-charging switchboards and motor-generator sets. These devices are described and illustrated in detail. Special mention is made of the sectional switchboard, which has proved very satisfactory for this class of work, enabling additions to be made to the outfit from time to time with slight expense.

Insulating and Impregnating Compounds.—The Condensite Company of America, Glen Ridge, N. J., has set forth in a 16-page pamphlet the uses of Halowax oil and Halowax (synthetic oil and waxes). These are chlorine substitution products having the properties of non-inflammability, high boiling points, and a wide range of melting points. They are used for impregnating paper and wood, fire-proofing fabrics, protecting cathodes, electrical coil impregnations, for belt dressing, and many other purposes.

Ball Bearings.—Bulletin No. 102 of the Norma Company of America, 20 Vesey Street, New York, refers to its annular bearings, double annular bearings and combined annular and ball thrust bearings. Bulletin No. 103 is devoted to roller bearings and combined roller and ball thrust bearings. Single ball thrust bearings and double ball thrust bearings are the subject of Bulletin No. 104. Each bulletin contains descriptions and illustrations of its subject matter and a number of tables giving dimension data and rated load.

Personal Mention

Mr. A. L. Brownell has been appointed superintendent of the Marquette County Gas & Electric Company of Ishpeming, Mich.

Mr. E. D. Blynn, Jr., has been elected vice-president of the Lincoln (Ill.) Railway & Light Company to succeed Mr. E. D. Blynn, Sr.

Mr. J. E. Webb has been appointed superintendent of the Parsons (Kan.) Railway & Light Company to succeed Mr. Theodore Dienst.

Mr. W. L. McKee has been elected vice-president of the Trinidad (Col.) Electric Transmission, Railway & Gas Company to succeed Mr. J. F. Wessel.

Mr. C. R. Laub has been appointed superintendent of the Public Service Company of Northern Illinois at Streator to succeed Mr. R. B. Basham.

Mr. Frank Morrison has been appointed chief engineer of the power station of the Union Traction Company, Coffeyville, Kan., to succeed Mr. O. E. Polk.

Mr. A. J. Bemis has been appointed general manager of the Vicksburg (Miss.) Light & Traction Company to succeed Mr. W. B. Moorman. Mr. Bemis was formerly chief engineer of the company.

Mr. R. J. Russell, secretary of the Century Electric Company, of St. Louis, Mo., will sail for an extended business trip to England and the Continent on Aug. 7, taking the steamer *Empress of Britain* from Quebec.

Mr. Edward M. Graham has been appointed assistant to the president of the Bangor (Me.) Railway & Electric Company. Mr. Graham was formerly assistant to the general manager of the Cumberland County Power & Light Company.

Mr. J. W. Cowles, of the Edison Electric Illuminating Company of Boston, sailed July 12 on the Hamburg-American S.S. *Cincinnati* for a seven weeks' trip through Germany, France and England. Mr. Cowles is accompanied by Mr. S. G. Rhodes, of the New York Edison Company.

Colonel George W. Goethals, chairman of the Isthmian Canal Commission and chief engineer of the Panama Canal, has consented to accept the honorary presidency of the International Engineering Congress and will preside in person over the general sessions to be held in San Francisco Sept. 20-25, 1915.

Mr. A. S. Nichols has been appointed manager of the Fort Madison (Ia.) Electric Company and the Dallas City Electric Light Company, two newly acquired Stone & Webster properties located about 25 miles from the Keokuk water-power development. Mr. Nichols was formerly assistant treasurer of the Mississippi River Power Company.

Mr. A. C. Blinn, president of the Evansville (Ind.) Public Service Company and vice-president of the Public Utilities Company of the same city, sailed on July 31 from New York City for Europe on the steamship *Cedric*. Mr. Blinn intends visiting London, Paris and several points in Switzerland, but has set no definite limit on the length of his trip, which will be devoted entirely to pleasure.

Mr. R. B. Hull has been made acting manager of the Edison Electric Company of Lancaster, Pa., and of the Lancaster County Railway & Light Company to succeed the late C. E. Titzel. Mr. Hull entered the service of the Lancaster company as an electrician in 1900 and in 1903 was appointed foreman of the meter department. On Oct. 1, 1910, he was promoted and made superintendent of the overhead department, and two years later he was made superintendent of the company.

Mr. A. T. Macdonald, formerly head of the new-business department of the Louisville Lighting Company, is now chairman of a special committee of Louisville manufacturers who are planning a "Made-in-Louisville" week for the latter part of August, when all downtown stores are to exhibit in their windows the products of Louisville factories. Mr. Macdonald was formerly secretary of the Louisville Commercial Club and for many years before that was engaged in newspaper work in Louisville. He also managed the Southern Electrical Exposition held in Louisville.

Mr. Holton H. Scott, who was elected a vice-president of the National Electric Light Association for the second time at its recent convention, was born in Orillia, Canada, Sept. 14, 1874. He was educated in the Ashland (Wis.) High School and the University of Wisconsin, graduating from the latter with the degree of B.S. in 1896. His first position was with the Madison (Wis.) Gas & Electric Company, where he was employed in general work. In 1901 he became superintendent of the Lincoln (Neb.) Gas & Electric Light Company and in the following year went to San Antonio, Tex., as engineer for the San Antonio Gas & Electric Company and the San Antonio Traction Company. He subsequently became general superintendent of the former and assistant to the president of the latter. In the spring of 1905 he returned to Madison, Wis., as general superintendent of the Madison Gas & Electric Company and in 1906 he came to New York City with H. L. Doherty & Company as chief engineer, examining all the properties taken over and owned by that company. He is at present general manager of the Doherty Operating Company, which operates 104 public-utility plants in all parts of the country, and is also a director in many of the corporations owned or controlled by H. L. Doherty & Company. Mr. Scott is a member of the National Commercial Gas Association, the New York Electrical Society and the National Electric Light Association and is an associate member of the American Institute of Electrical Engineers. He has been chairman of the membership committee of the N. E. L. A. for the past four years.

HOLTON H. SCOTT

Mr. W. H. Morton, who resigned as secretary of the National Electrical Contractors' Association at the Chattanooga convention last week, the resignation to become effective Sept. 1, was born in Springfield, Mass., in 1869. His father is Judge James H. Morton, of that city. Educated in the public schools of Springfield, Mr. Morton afterward took a two years' course in the Gunnery Preparatory School of Washington, Conn., and the first three years after leaving school were spent in the woolen business at Ware, Mass., with the Gilbert Manufacturing Company. Mr. Morton early evinced an inclination toward electricity, and in 1890 took up the two years' students' course at the works of the General Electric Company at Schenectady. After completing this course he was placed in charge of the testing department of the Schenectady works until 1895, at which time he went to Utica, his present home, to enter the electrical contracting business. He continued in this business until 1905, at the same time carrying on the continually increasing duties of secretary of the National Electrical Contractors' Association. Since 1905, however, he has devoted all of his time to the latter work. In addition to his many important duties as secretary of the National Electrical Contractors' Association Mr. Morton has also managed the *National Electrical Contractor*, the official monthly magazine of the association. From 1898 to 1902 Mr. Morton was secretary of the New York State Electrical Contractors' Association. He was also secretary of the Knit Goods Manufacturers' Association, the Utica Employers' Association and the Park Board of the city of Utica. Mr. Morton recently purchased a large tract of land in Porto Rico for the purpose of growing grapefruit, and he has resigned from the National Electrical Contractors' Association to devote his time to this business.

W. H. MORTON

Construction

New England

BRADFORD, VT.—The Bradford El. Lt. Co. has decided to make two new extensions of about 1 mile each to its lighting service (2200 volts) in Newbury. A. F. Dickey is manager.

ESSEX JUNCTION, VT.—The Burlington Lt. & Pwr. Co. is building a new power plant at Essex Junction, which will use the entire power of the Winooski River under a 65-ft. head. The work is being done by the Snare & Triest Co., Woolworth Building, New York, N. Y., which is also replacing an old timber dam at the Burlington Lt. & Pwr. Co.'s present station near Winooski with a concrete dam. J. J. Kennedy, 52 Broadway, New York, N. Y., is consulting engineer.

FAIRHAVEN, VT.—The Western Vermont Pwr. & Lt. Co., of Fairhaven, has applied to the Public Service Commission of New York for permission to erect a transmission line to Granville for the purpose of furnishing electricity for lamps and motors in that place.

MONTPELIER, VT.—The Waterbury Lt. & Pwr. Co. of Montpelier, successor to Moody & Allen, expects to purchase within the next 30 days one 500-hp water-tube boiler and a 500-hp engine with condenser, etc. G. H. Almon is manager.

WINDSOR, VT.—The Windsor El. Lt. Co contemplates a general reconstruction of its older lines and would like to communicate with dealers in new chestnut poles. The company has just completed about 2 miles of rural lines on the River Road in Cornish, N. H., toward the Claremont line. Richard P. Osgood is superintendent.

LENOX, MASS.—The Lenox El. Co. has begun work on the installation of a new street-lighting system, consisting of 100 tungsten lamps of 32 cp erected on ornamental posts and maintained by underground cables. Contracts have already been placed for materials. The Rogers El. Co., of Lenox, Joseph Franz, engineer, will have charge of the work.

PAXTON, MASS.—A warrant calling for a special town meeting has been drawn by the Selectmen to vote on the proposition to erect an electric-light system, the cost not to exceed $5,000; also to appoint a committee to have charge of building the plant and to authorize this committee to enter into a contract for not more than 10 years with some electrical company to furnish energy to operate the system.

WARE, MASS.—The Ware El. Co. has nearly completed the installation at the Ware substation of three 1500-kva, 66,000-11,000-22,000-volt transformers. When this installation is completed the 14 towns now supplied by the Ware El. Co., the North Brookfield El. Lt. & Pwr. Co. and the Central Massachusetts El. Co. will be furnished with current from the lines of the Connecticut River Transmission Co. The substation is the property of the Ware El. Co. The 22,000-volt lines which traverse the territory have been erected during the past year. H. W. Parsons is manager.

HARTFORD, CONN.—The contract for furnishing 100 single and 100 double iron lamp standards for the ornamental street-lighting has been awarded to Story & Stephens Co., of New York, N. Y. The price paid for the double standards was $3,400 and for the single standards $3,100.

Middle Atlantic

ELMIRA, N. Y.—The Elmira Wtr., Lt. & Pwr. Co. is building a 20,000-kw power plant. Contracts have been placed for the entire plant. F. H. Hill is acting general manager.

GROTON, N. Y.—The Board of Water & Light Commissioners expects to purchase within the next few months materials for distribution system to replace wires now in use. Charles O. Rhodes is clerk.

MORRISTOWN, N. Y.—The Gregory El. Co., Inc., successor to the Northern Lt. Co., has purchased and will soon install Garton & Daniels lightning arresters as a further protection to its distributing system. J. M. Gregory is manager.

NEW YORK, N. Y.—Bids will be received at the office of the Armory Board, Hall of Records, Chambers and Centre Streets, New York, until Aug. 7, for electrical equipment for Twelfth Infantry Armory, Sixty-second Street and Columbus Avenue, borough of Manhattan. Bidders are requested to make their bids upon blank forms prepared by the Armory Board, a copy of which may be obtained, together with a copy of contract, including specifications, upon application to the above office.

ROCHESTER, N. Y.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 20 for additional conduit and wiring, plumbing, heating, lighting fixtures, etc., in the first story of the United States court house and post office in Rochester, in accordance with plans and specifications, copies of which may be had at the above office or at the office of the custodian, Rochester. O. Wenderoth is supervising architect.

ROCHESTER, N. Y.—The Rochester Ry. & Lt. Co. is installing additional boilers for supplying two 2700-kw turbo-generators. Three 3000-kw rotary converters will be installed for the Edison system, together with considerable new switchboard equipment. The company is also making extensions throughout the city for both factory and residential lighting, and is placing approximately 300 of the new inverted magnetite-arc lamps in the business section. T. H. Yawger is superintendent of the electrical department.

ROUSES POINT, N. Y.—A new 150-hp boiler is now being installed in the municipal electric-light plant. A new switchboard and tungsten street lamps have just been installed. H. A. Sabourin is manager.

SYRACUSE, N. Y.—The Board of Contract and Supply has rejected the proposal submitted by the Syracuse Ltg. Co. for street-lighting, ornamental lighting for the city buildings and energy for motors for a period of five years. The board has instructed R. D. Roney, secretary, to re-advertise proposals for lighting the city.

UNION SPRINGS, N. Y.—The Union Springs Lt. & Pwr. Co. is starting a campaign to wire up and connect 50 houses in this town, and expects to purchase a few meters. George W. Hull is general manager.

UTICA, N. Y.—The Utica Gas & El. Co. has applied to the public Service Commission for permission to erect electric transmission lines and to exercise franchises in the village of Holland Patent and in the hamlet of Sauquoit, town of Paris, Oneida County.

WEEDSPORT, N. Y.—The Board of Trustees of the village of Weedsport has applied to the Public Service Commission for permission to install an electric plant to furnish electricity for lamps and motors to residents in Weedsport.

FREELAND, PA.—The Harwood El. Co., of Hazleton, has recently completed the construction of a new brick and steel substation, having an output of 3000 kw. The station is equipped with General Electric switchboard equipment, step-down transformers, etc.; also two 50-lamp Westinghouse mercury arc rectifiers, supplying energy to Westinghouse series metallic flame-arc lamps for municipal lighting. John S. Wise, Jr., is manager.

GETTYSBURG, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 3, for completion, including plumbing, gas piping, heating apparatus, electric conduits and wiring and lighting fixtures, of the United States post office at Gettysburg, in accordance with drawings and specifications, copies of which may be obtained from the superintendent of construction at Gettysburg or from the above office. O. Wenderoth is supervising architect.

PHILADELPHIA, PA.—The Philadelphia Rapid Transit Co. has recently awarded a contract for the construction of a new steel and concrete power house at the corner of Thirty-second and Dauphin Streets, at a cost of $15,000.

PHILADELPHIA, PA.—Bids will be received at the office of the commanding officer, Frankford Arsenal, Philadelphia, Pa., until Aug. 5, under circular No. 15 for the installation of underfeed mechanical stokers in the boiler room of the power plant at the Frankford Arsenal, Philadelphia. Further information may be obtained upon application to the commanding officer.

HAMMONTON, N. J.—The Council recently authorized Mayor Burt and Town Clerk Seely to sign a contract with the Hammontown Tel. & Teleg. Co. for the installation of a fire alarm system in the homes of the volunteer firemen.

CUMBERLAND, MD.—The Edison El. Illg. Co., of Cumberland, it is reported, contemplates the installation of a 1000-kw turbine.

ALDERSON, W. VA.—The Alderson Lt. & Pwr. Co. is rebuilding and equipping its old plant. The company will furnish electricity for lamps and motors in Alderson.

CULPEPER, VA.—The Culpeper Lt. & Ice Co. expects to purchase within the next few months a Babcock & Wilcox boiler, a 10-in. by 30-in. Corliss engine and a 75-kw General Electric direct-current generator, also one panel for switchboard, three switches with inclosed fuses and an ammeter and voltmeter. Within the next few weeks the company will establish day service for motors. G. F. Major is manager.

FREDERICKSBURG, VA.—The Rappahannock El. Lt. & Pwr. Co., of Fredericksburg, expects to erect within the next three months 4 miles of 6600-volt rural distribution lines and rebuild 9 miles of distributing lines in the city, and also expects to purchase within the next three months two 200-kw alternators (belted), 5 miles of weather-proof wire, 300 poles, 2000 insulators, cross-arms, etc. S. C. Foster is superintendent.

ROCKY MOUNT, VA.—Bonds to the amount of $50,000 have been voted for the installation of water, light and sewer systems. J. L. Ludlow, of Winston-Salem, N. C., is engineer. W. A. Belcher is recorder.

WASHINGTON, D. C.—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, D. C., until Aug. 13, for furnishing material and labor (unless otherwise specified) required for rewiring the third floor and galleries of the Patent Office Building, Washington, D. C., in accordance with plans and specifications, copies of which may be obtained upon application to the chief clerk of this department. Lewis C. Laylin is assistant secretary.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 5 for miscellaneous wire to be delivered at the Brooklyn navy yard as follows: Schedule 5650—6000 ft. plain interior communication cable, 200,000 ft. plain double flexible portable conductor, 100,000 ft. double flexible silk conductor, 50,000 ft. telephone cord, 250,000 ft. bell wire; Schedule 5649—42,000 ft. duplex rubber-insulated lighting and power wire, 166,000 ft. single rubber-insulated lighting and power wire, 10,000 ft. twisted telephone wire (No. 14). T. J. Cowie is paymaster-general, United States Navy.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 11, as follows: Item (1) 1200 ft. rubber-insulated power cable, similar to type 650, specification No. 432-D, except that it shall be three-conductor, each conductor consisting of 19 strands, each 66.4 circ. mil in diameter; (2) 1500 ft. rubber-insulated, lead-covered and armored one-conductor cable, specification No. 580; (3) 1300 ft. rubber-insulated, lead-covered and armored four-conductor cable, specification No. 580; (4) 1000 ft. rubber-insulated, lead-covered and armored ten-conductor cable, specification No. 580; each of the above items (2, 3 and 4) to be delivered in one length on one reel; cost of reel to be submitted separately; (5) 18,000 ft. submarine cable, type 325, specification 427-F; (6) 1000 ft. submarine cable, type 325, specification 427-F, same as item 5, except that it shall have a double armor; the outer armor should be of the same size as the other and to be laid on as prescribed in specification 431-C for double-armored cable: items 5 and 6 to be supplied in one length of 19,000 ft. and properly cribbed on a ship in New York Harbor. Major W. L. Clarke is disbursing officer.

North Central

BAD AXE, MICH.—The managers of the municipal light and water plant expect to purchase within the next three months one 72-in. by 16-ft. boiler complete, with all fittings, for the municipal electric plant. William H. Niswanger is superintendent.

BAY CITY, MICH.—The lighting committee of the Common Council has recommended the adoption of the luminous-arc-lamp system for street-lighting. The cost of installing the system is estimated at $27,000.

DETROIT, MICH.—The Ford Motor Co., it is reported, will soon install a 3000-kw low-pressure turbine in its power plant. Edward Gray is chief engineer.

DEXTER, MICH.—The Eastern Michigan Edison Co., of Detroit, will supply electricity for lamps and motors in Dexter from its plant in Ann Arbor. The company has made arrangements with the Village Board to purchase the local municipal electric-light plant for $9,000, subject to the vote of the people.

GRAND RAPIDS, MICH.—Contracts will soon be awarded by Messrs Brown, Billings and Averill, county poor superintendents, for the installation of a small power plant at the county farm, to cost about $1,000.

NEWBERRY, MICH.—Arrangements, it is reported, are being made by William Horner for the construction of a hardwood flooring mill, which will be equipped with electrically operated machinery. Electricity will be generated by the power plant connected with the mill.

SAULT STE. MARIE, MICH.—The Edison Sault El. Co., of Sault Ste. Marie, expects to erect an addition to its power house within the next six or eight months to provide space for one 500-kw generator and waterwheel, orders for which have been placed; also to make some additions to distribution system, material for which is on hand. William Chandler is vice-president and general manager.

THREE RIVERS, MICH.—The Constantine Hydraulic Co., of Three Rivers, expects to purchase within the next two months recording instruments for station, wattmeters, etc. The company is contemplating the purchase of lamp standards, carrying three and four-lamp clusters; nothing definite has yet been decided upon. H. C. Sterling is manager.

BARBERTON, OHIO.—The City Council has adopted a resolution authorizing the director of public service to engage H. Whitford Jones, 1114 Citizens' Building, Cleveland, as consulting engineer in connection with the construction of the proposed municipal electric-light plant.

BRYAN, OHIO.—The contract for furnishing material and installing the ornamental street-lighting system has been awarded to the Kokomo El. Const. Co., of Kokomo, Ind., to cost about $5,000. The contract provides for the erection of 70 lamp standards, carrying five-lamp (Mazda) clusters. S. E. Folk is superintendent of the municipal light and water plant; John A. Neil city clerk.

COLUMBUS, OHIO.—The City Council has passed an ordinance appropriating $25,000 for extensions to the municipal electric-light plant and lighting system. H. E. Eichhorn is superintendent of municipal plant.

KENT, OHIO.—During the past year the Kent Wtr., Lt. & Pwr. Co. has been changed from 1100-volt, 133-cycle, single-phase, to 2200-volt, 60-cycle, three-phase operation, and new equipment purchased. For the past nine months the plant has been furnishing energy for motor service as well as lighting. S. F. Messer, superintendent.

BURNSIDE, KY.—The Kentucky Utilities Co., of Lexington, which recently purchased the property of the Burnside El. Lt. Co., is erecting a transmission line from Somerset to Burnside, a distance of 9 miles. When completed a 24-hour service will be established.

CALHOUN, KY.—The Green River Lt. & Wtr. Co., of Calhoun, expects to purchase within the next few months a direct-connected generator and will have one for sale (Ball engine and General Electric generator, belted). C. G. Gilmore is manager.

CENTRAL CITY, KY.—The Central City Lt. & Pwr. Co. expects to purchase within the next two months one 150-hp boiler. I. V. Fortney is secretary.

COVINGTON, KY.—Bids will be received by H. G. Klosterman, city clerk, until Sept. 26 for a franchise to construct and operate a street railway system in the city of Covington by electricity or motive power other than steam for a period of 20 years. Approximately 25 miles of track are authorized within the city limits. Further information may be obtained upon application to the city clerk.

EARLINGTON, KY.—Foundations are being laid at Earlington, it is reported, for the new plant of the Central El. Co.

GLASGOW, KY.—The Glasgow El. Lt. & Ice Co. expects to purchase within the next 12 months one 150-kva turbo-generator. B. G. Dickinson is president.

HARDINSBURG, KY.—Prominent citizens, it is reported, are behind a project to organize a company to furnish electricity for the town.

LA GRANGE, KY.—The La Grange Lt. & Pwr. Co. is reported to be contemplating the installation of a street-lighting system.

MORGANFIELD, KY.—The Morganfield Lt. & Pwr. Co. expects to erect within the next six months a new brick power house and to purchase two 200-hp internally fired boilers, two three-phase, 60-cycle, 2300-volt revolving-field belted alternators, one 200-hp engine and main switchboard. F. W. Gilbert is president.

NEWPORT, KY.—The City Commissioners have started a campaign for additional boulevard lamps. The present plan provides for the cost of installation to be paid by the merchants.

CENTERVILLE, IND.—Bids will be received by the Board of Trustees of the town of Centerville until Aug. 8 for the installation of a high-tension transformer station and electric distribution system for the town of Centerville, according to plans and specifications on file in the office of the town clerk, Centerville, and at the office of the *Electrical World*, 239 West Thirty-ninth Street, New York, N. Y. Benjamin C. Gaiser is president of board and Wilbert A. Bertsch town clerk.

INDIANAPOLIS, IND.—Improvements, it is reported, are contemplated by the Merchants' Ht. & Lt. Co., of Indianapolis, to its local plants, involving an expenditure of $100,000. The work will include the installation of a large turbine engine at the West Washington Street power plant. Additional equipment will be installed at the South Jersey Street station, including boilers, increasing the output of the plant by 3000 hp, automatic stokers and other smoke-consuming devices, and also a new switchboard. The company is reported to have closed a contract to furnish energy for the Federal Building. Eleazor Darrow is manager.

KNOX, IND.—The Knox El. Lt. & Pwr. Co. has purchased and expects to install one 16-in by 36-in. Corliss engine within the next two months. The company also expects to change the present street-lighting system to incandescent Mazda lamps before fall. Thomas A. Grist is owner.

NEWCASTLE, IND.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 8, for the construction complete (including mechanical equipment, interior lighting fixtures and approaches) of the United States post office at Newcastle. Drawings and specifications may be obtained at the above office or from the custodian of site at Newcastle, O. Wenderoth is supervising architect.

PERU, IND.—The managers of the municipal electric-light plant expect to erect a distribution line to include the suburb of Oakdale, a distance of about 1½ miles, to furnish energy for manufacturing purposes, and also to purchase within the next few months a water-softening system and six 20-kva, three 10-kva and two 5-kva transformers. G. C. Anderson is manager.

PORTLAND, IND.—The City Council expects within the next 60 days to erect a power house, 40 ft. by 58 ft., for the municipal electric-light plant, and within the next 30 days to purchase one 750-hp Corliss engine and one 500-kw generator, directly connected. Ornamental lamp posts will be erected in the city, doing away with the arc system. At present the wires are being transferred from the streets to alleys. Fred Drury is city electrician.

SCOTTSBURG, IND.—The Indianapolis & Louisville Trac. Co. is contemplating the installation of a complete commercial system in Scottsburg. The municipal plant operates the street-lighting system only, consisting of 80 tungsten lamps of 60 cp, for which energy is supplied by the Indianapolis & Louisville Ry. Co.

TIPTON, IND.—Extensive improvements have been made to the municipal electric-light plant, including the installation of 500-hp boilers and accessories, with building and ground, also other improvements, involving an expenditure of about $20,000. Plans are now being considered to rebuild thoroughly the entire wiring system and to renew the lighting system within the next 12 months. Arthur C. Herrin is superintendent.

BARRY, ILL.—The city of Barry is considering the installation of a municipal electric-light plant. G. W. Nations is engineer. T. M. Dwyer is chairman of light committee.

CANTON, ILL.—Extensive improvements, it is reported, are contemplated by the Canton Gas & El. Co., including the installation of a 1500-kw turbo-generator set. Work will soon begin on the erection of a high-tension line transmission to Glasford to furnish electrical service there.

ELGIN, ILL.—The Chicago Tel. Co. contemplates placing its wires underground and transferring all pole lines in alleys before 1919. The cost of the work is estimated at about $100,000.

HILLVIEW, ILL.—The commissioners of the Hartwell drainage and levee district contemplate the erection of a pumping plant with electrical equipment to operate three 30-in. pumps. Energy will be supplied by the Central Illinois Pub. Ser. Co., of Mattoon.

KEWANEE, ILL.—The Spring Valley Gas & El. Co., which operates in Spring Valley and Versailles, it is reported, will ask the City Council for a franchise to supply electricity for lamps and motors in Kewanee. The installation of an ornamental street-lighting system is contemplated. If granted a franchise, the company will extend its lines from Neponset.

MONMOUTH, ILL.—Petitions are being circulated asking that a special election be called to vote on the proposition to grant the Monmouth Pwr. & Lt. Co. a franchise to operate an electric-lighting system in Monmouth.

NOKOMIS, ILL.—The installation of a municipal electric-light plant in Nokomis is under consideration by the City Council.

STREATOR, ILL.—The Public Ser. Co. of Northern Illinois, it is reported, will erect a large power plant at Spring Lake, near Streator, plans for which are now being prepared.

BEAVER DAM, WIS.—The Beaver Dam Lt. & Pwr. Co. has recently purchased water meters, steam separator, materials for resetting boilers, also poles, wire, hardware, etc., for street-lighting at Horicon. D. C. West is president.

HAMMOND, WIS.—Plans are being considered to discontinue the local gas plant and secure energy for lighting the town from the Burkhardt Milling & El. Pwr. Co., of Burkhardt.

NEW LONDON, WIS.—The managers of the municipal electric-light plant and water-works system expect to erect within the next six months a concrete reservoir and pumping station and lay about 40,000 ft. of 6-in. water mains and about 1200 ft. of 8-in. mains; also to purchase one 150-hp boiler, an engine and generator and one electrically operated pump. O. H. Pribnow is superintendent.

PARDEEVILLE, WIS.—The owners of the local electric-light plant expect to purchase within the next six months six street-lighting fixtures and some washing machines. Joseph Chandler is treasurer and manager.

SPRING VALLEY, WIS.—The Chippewa Valley Ry., Lt. & Pwr. Co., of Eau Claire, has purchased the property of the Spring Valley Lt. & Pwr. Co. A transmission line has been erected from Elmwood to Spring Valley, a distance of 8 miles, and energy from the Menomonie Red Wing line will be used to operate the system here. The local steam plant will be used as an auxiliary.

AURORA, MINN.—The Village Council is considering the installation of additional equipment for the municipal electric-light plant.

BREWSTER, MINN.—The proposition to issue bonds for the installation of a municipal electric-light plant was defeated at an election held recently. W. N. Reestroffe is clerk.

ELIZABETH, MINN.—We are informed that the proposition of installing an electric-light plant in Elizabeth has been abandoned for the present. Joseph C. Rian is clerk.

FARMINGTON, MINN.—The Farmington El. Lt. & Pwr. Co. has recently installed a 240-amp-hr. storage battery at a cost of $3,000 and has established a 24-hour service. F. H. Eddy is manager.

FREEPORT, MINN.—At an election held July 15 the proposition to issue $6,000 in bonds for the construction of a municipal electric-light plant was carried.

HUTCHINSON, MINN.—The Hutchinson Ltg. & Mfg. Co. is making extensive improvements to its properties in Hutchinson and Glencoe as follows: At the Hutchinson plant one 75-kw and one 200-kw General Electric three-phase generator and a 200-kw steam unit will be installed in the near future; also three generator panels, one double-circuit feeder panel, a Tirrill regulator, three General Electric feed regulators and three 40-kva, 13,300-2300-volt transformers. At the Glencoe station one 50-kva General Electric synchronous condenser, one three-phase generator panel for same, one double-circuit feeder panel, one Tirrill regulator panel and three General Electric 40-kva, 13,200-2300-volt transformers will be installed. A three-phase, 60-cycle, 13,200-volt transmission line from Hutchinson to Glencoe, passing through Biscay, 17½ miles long, will be erected. Cedar poles, 42 to the mile, and No. 6 copper wire with ground wire and telephone circuit will be used, and General Electric aluminum-cell lightning arresters. The work is now in progress except the transmission line, for which contract will soon be let. Thomas Pitts is manager of both properties.

OWATONNA, MINN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 1, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Owatonna. Drawings and specifications may be obtained from the custodian of site at Owatonna, or at the above office. O. Wenderoth is supervising architect.

PAYNESVILLE, MINN.—The town of Paynesville expects to install an ornamental lighting system on about two blocks, using five-lamp clusters. Roy R. Spindler is superintendent of the municipal electric plant.

SAUK CENTER, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until Aug. 13 for erection complete of two cottages at the Home School for Girls, Sauk Center, including the general contract work, heating and ventilating, plumbing and the electrical work and fixtures in accordance with plans and specifications prepared by C. H. Johnson, architect, 715 Capital Bank Building, St. Paul. Copies of plans and specifications may be seen at the Builders' Exchange, St. Paul and Minneapolis, at the superintendent's office at the Home School for Girls, Sauk Center, and at the office of the State Board of Control, State Capitol Building, St. Paul.

SPRING VALLEY, MINN.—The new owner of the Spring Valley electric plant, it is reported, is preparing plans for rebuilding the entire plant.

WOODLAKE, MINN.—A special election will be called to vote on the proposition to issue $9,900 in bonds to establish an electric-light and power plant, including the erection of a transmission line connecting this village with Granite Falls.

CEDAR FALLS, IA.—Contracts for construction of the municipal electric-light and power plant have been awarded to the Murray Iron Works Co., of Burlington, Ia., and the Fort Wayne El. Works. C. H. Streeter is city engineer.

CEDAR RAPIDS, IA.—The Quaker Oats Co., of Cedar Rapids, has awarded a contract to the Iowa Ry. & Lt. Co., of Cedar Rapids, to furnish energy to operate its plant for a period of 50 years. The Iowa Ry. & Lt. Co. is reported to have ordered a new 1500-hp boiler and will soon place contract for a 4000-kw generator. The plant of the Quaker Oats Co. will be dismantled. The contract provides for 3000 hp. The power company is also to furnish steam to the cereal mills for all purposes. A high-pressure main will be built from the power house to the cereal plant.

FONDA, IA.—At an election held recently the proposition to issue bonds to construct a municipal electric-light plant was carried.

GILBERTVILLE, IA.—Steps have been taken by a number of prominent residents of Gilbertville toward the organization of a company to erect an electric-lighting system here. It is proposed to erect a transmission line through the principal streets of the village, connecting with the Waterloo, Cedar Falls & Northern Ry. Co.'s power house near here. The company will be known as the Gilbertville Ltg. Co., and will be capitalized at $2,000. John Nemmers is interested in the project.

MARENGO, IA.—The Marengo Lt. & Pwr. Co. was recently purchased by the Iowa Ry. & Lt. Co., of Cedar Rapids. V. T. Matthews is manager at Marengo.

MAXWELL, IA.—The City Council has passed an ordinance granting C. E. Lookingbill and W. C. Enfield, of the Maxwell El. Lt. & Pwr. Co., a franchise to construct and operate an electric-light plant in Maxwell. A special election has been called for Aug. 5 to ratify the franchise.

MONTEZUMA, IA.—At an election held recently the citizens voted to grant the Oskaloosa Trac. & Lt. Co., of Oskaloosa, recently taken over by the McKinley interests, a 25-year franchise to furnish electricity here. A transmission line will be erected from Oskaloosa to Montezuma. The company agrees to furnish a 24-hour service.

NEW HARTFORD, IA.—A 20-year franchise has been granted to local parties for the installation of an electric-light plant in New Hartford. The contract for equipment, wiring and installing plant has been awarded to Charles Simonsen, of Cedar Falls. The cost of plant is estimated at $10,000.

OSAGE, IA.—The Osage El. Lt., Ht. & Pwr. Co., it is reported, will build a new concrete dam on Cedar River. Additional machinery costing $15.000 will be installed in the electric-light plant. W. J. Ferris is president of the company and Robert Ferris is secretary and treasurer.

POMEROY, IA.—Bonds to the amount of $15,000 have been voted for the installation of an electric-lighting system here. A transmission line will be erected to connect with the Northern Iowa Pwr. Co.'s line near Pocahontas.

SHELDON, IA.—The Sheldon Lt. & Pwr. Co. erected last year 1.5 miles of line for pumping the city water, installing a 25-hp Century motor. The company is now installing 32 five-lamp electroliers, using 2400 ft. of steel-taped cable. O. E. Logan, owner.

SIOUX CITY, IA.—The Sioux City Service Co. is erecting an addition to its power plant and has purchased two 400-hp Stirling boilers, two Green grate stokers, a 3000-ft. air-compressor, two 16-in. wells and a new 18-panel Westinghouse switchboard. E. L. Kirk is general manager.

VALLEY JUNCTION, IA.—The City Council has adopted a resolution authorizing the purchase of the local electric plant for $10,000. Nothing definite on construction has been decided upon.

VILLISCA, IA.—An agreement has been reached by the City Council and the Villisca Public Service Company whereby the company is granted a 25-year franchise, subject to the approval of the voters. Energy for operating the system, it is reported, will be furnished by the Red Oak El. Co.

WINTERSET, IA.—Two new engines, 72 in. by 18 ft., high-pressure tubular boilers, are being installed in the municipal electric-light plant. L. O. Klein is superintendent.

BLACKWATER, MO.—The installation of a municipal electric-light plant in Blackwater is under consideration.

ELSINORE, MO.—The McDonald Charcoal Co., of Elsinore, is reported to be contemplating the installation of an electric plant in connection with its proposed furnace and chemical plant. L. W. Searles, Woodward Building, Birmingham, Ala., is engineer and general manager of the company.

MARCELINE, MO.—Bonds to the amount of $10,000 have been voted, the proceeds to be used for improvements to the municipal electric-light plant.

SLATER, MO.—The managers of the municipal electric-light plant expect to purchase within the next few months one 350-kw water turbine or Corliss engine. L. E. Shepherd is superintendent.

BOWBELLS, N. D.—The City Council has granted J. M. Bearden, of Graceville, Minn., a 20-year franchise to erect and maintain an electric-light plant in Bowbells.

MAYVILLE, N. D.—Bids will be received at the office of the State Normal School at Mayville until Aug. 19 for the installation, including labor and materials, of a system of automatic temperature regulation in the main building. Separate bids will be received at the same time and place for rewiring by conduit system, including all work and materials, except fixtures, of the same building for electric lighting. Thomas A. Hillyer, of Mayville, is president.

MAYVILLE, N. D.—Contracts for construction of a water, light and power plant at Mayville have been awarded as follows: For power house to the Boyd Construction Co., of St. Paul, Minn., at $8,108; reinforced concrete stack to the Concrete Metal Chimney Co., of St. Louis, Mo., at $1,435; boilers, engines, generators and pumps installed complete to the Northwestern El. Equipment Co., of St. Paul, Minn., for $19,383, and for sewer and water connections to M. Barr, of Mayville, at $3,074. The Oscar Claussen Engineering Co., of St. Paul, Minn., is consulting engineer.

MOBRIDGE, S. D.—Bids will be received by the city auditor of the city of Mobridge until Aug. 11 for the installation of an electric-lighting system as follows: (1) For furnishing all material and labor for installing 12 Cutter's Riverside ornamental lamp-posts, three lamps to post, with bulbs and globes complete, to be connected up with underground lacquered conduit, No. 6 copper wire, all to be attached ready for service; (2) separate bids for material f.o.b. Mobridge, as in proposition 1, and for installing said material; (3) for furnishing and installing electric lamps at 12 different points, more or less, on Grand Crossing Avenue, cedar poles, 7-in. tops, equal to those now in use by the electric-light company, each lamp to be equipped with material equal to the one standard Cutter's street hood (three 60-watt Mazda lamps); separate bids for material and installation as in proposition 3. Material f.o.b. Mobridge. Charles H. Smith is Mayor and W. L. Youngman is city clerk.

ALMA, NEB.—Bids will be received until Aug. 12 by J. B. Billings, Mayor, or A. H. Reed, city clerk, for two 100-hp tubular boilers, one 80-hp and one 75-hp Corliss engine, one 50-kva, 60-cycle, 2300-volt generator and one 2-kw, 125-volt generator with accessories.

DAVID CITY, NEB.—The city of David City is contemplating the construction of a municipal electric-light plant. The proposed plant will be driven by a gas engine. The work will also include the construction of four blocks of subsurface conduits. L. L. Thompson is city clerk.

DESHLER, NEB.—The Deshler Lt. & Pwr. Co., it is reported, contemplates the installation of a large steam engine. The company is planning to increase the output of its plant in order to supply energy to all towns in Thayer County.

HOWELL, NEB.—The electric light commission expects to purchase about $300 worth of incandescent lamps. George Lodes is village clerk.

OSMOND, NEB.—The Leedom-Coons-Leedom El. Co., of Osmond, expects to purchase within the next six months storage batteries for 110-volt service on day circuit. J. W. Leedom is manager.

PRAGUE, NEB.—Within the next three months the managers of the municipal electric-light plant expect to erect a new cement-block power house for a water and electric-light plant, and within the next two months they expect to purchase Mazda lamps, for which contract has been placed. For further information address Anton Kasper. Milo Fabian is engineer.

SALEM, NEB.—The installation of a municipal electric-light plant in Salem is under consideration.

UNIVERSITY PLACE, NEB.—The municipal electric-light commission expects to purchase within the next year one deep-well pump, and within the next six months some plant devices, line material and lamp-posts. F. Harbican is a member of the committee.

VERDON, NEB.—The installation of a municipal electric-light plant in Verdon is under consideration.

ARMA, KAN.—The Commercial Club has instructed the executive committee to look into the matter of installing an electric-light and power plant and water-works system in Arma. A. E. Sellsman is secretary of the club.

CAWKER CITY, KAN.—The power plant of the El. Lt. & Pwr. Co. of Cawker City is reported to have been destroyed by fire, causing a loss of from $12,000 to $14,000.

CLAY CENTER, KAN.—The installation of the new ornamental street-lighting system (five-lamp clusters) in connection with the municipal electric-light plant is nearly completed.

COLDWATER, KAN.—The managers of the municipal electric-light plant expect to purchase within the next three months one 100-hp to 150-hp oil engine, one 75-kw to 100-kw, three-phase, 60-cycle, 2300-volt generator, switchboard for 75-kw to 100-kw generator and material for extension to water and light mains. L. A. Baldwin is superintendent.

DODGE CITY, KAN.—The Midland Wtr., Lt. & Ice Co., of Dodge City, expects to purchase within the next two months one 200-kw generating unit complete, either turbine or engine driven. The present plant generates three-phase, 60-cycle, 2300 volts.

EL DORADO, KAN.—The El Dorado El. & Refrigerating Co. expects to purchase within the next three months a synchronizing set for two two-phase, 2400-volt, belt-driven alternators. F. A. Pielsticker is manager.

ELLIS, KAN.—Within the next six months the town of Ellis expects to purchase for the municipal electric-light plant one 50-kw, three-phase, 2300-volt alternator, one 80-hp oil engine and one single-panel board for above unit. D. C. Watkins is superintendent.

HANOVER, KAN.—The managers of the municipal electric-light plant expect to purchase within the next four months incandescent lamps, some household labor-saving devices and wiring supplies. J. G. Granzer is superintendent.

JETMORE, KAN.—Bonds to the amount of $10,000 have been issued for the installation of water and light systems. Arrangements are being made to raise the issue to $16,000. Materials and supplies have not yet been purchased. Worley & Black, Reliance Building, Kansas City, Mo., are consulting engineers. L. W. Hubbell is city clerk.

LEBANON, KAN.—The installation of a municipal electric-light plant is under consideration.

MARION, KAN.—The city of Marion is contemplating the installation of steam engines and boilers in the municipal electric-light and water plant. H. A. Rowland, of McPherson, is engineer.

SHADY BEND, KAN.—The Shady Bend Milling & Pwr. Co. expects to erect within the next 12 months transmission lines to the towns of Beverly, 2½ miles distant; thence to Tescott and Culver. The three towns are within 15 miles, all on the same line.

SOUTH HAVEN, KAN.—The South Haven El. Lt. Co. expects to purchase within the next six months one 50-hp internal-combustion engine with generator directly connected. J. R. Britton is manager.

ST. PAUL, KAN.—At an election held recently the proposition to issue bonds to the amount of $12,000 for the installation of a municipal electric-light plant was carried.

STERLING, KAN.—The Morris Electrical Pwr. Co., of Sterling, expects to purchase within the next 30 days one 50-kw generator and one 60-hp oil engine and switching equipment for same. C. H. Love is manager.

TOPEKA, KAN.—The city of Topeka expects to purchase within the next six months one 500-hp exhaust-steam, open feed-water heater for the municipal electric-light plant. The installation of a 500-kva, 60-cycle, 2200-volt generator has just been completed. The contract for extension to the ornamental street-lighting system has been awarded to the Tucker Electrical Co., of Topeka, for $15,000. The contract provides for the installation of 92 ornamental lamp standards, carrying five-lamp clusters. Elmer G. Stahl is superintendent.

WAMEGO, KAN.—The managers of the municipal electric-light and water plant expect to purchase within the next three months one Tirrill regulator for voltage regulation of two alternating-current generators. D. A. Course is superintendent.

Southern States

RANDLEMAN, N. C.—The Randolph Pwr. Co., of Randleman, has recently installed a 50-hp Adams oil engine to carry the plant during light-load periods. C. W. Petty is secretary and treasurer.

ST. PAULS, N. C.—The St. Pauls Lt. & Pwr. Co. expects to purchase within the next two months No. 8 weatherproof wire, transformers and tungsten lamps.

LAKE CITY. S. C.—Bonds to the amount of $7,500 have been voted for the installation of an electric-light system here.

SENECA, S. C.—The Seneca Oil Mill, it is reported, is planning to install one 100-hp and three 75-hp induction motors, for use on three-phase, 40-cycle, 2300-volt circuit, to operate oil mill and ginnery.

REIDSVILLE, GA.—The City Council has awarded contract to the Modern Equipment Co., of Savannah, for the installation of a municipal electric-light plant, to cost about $6,000.

SOUTH JACKSONVILLE, FLA.—Bonds to the amount of $65,000 have been voted, the proceeds to be used for extension of water, sewer and electric-light systems, street paving, building city hall, etc. E. M. Gibbons, of South Jacksonville, is designing engineer.

DAYTON, TENN.—The Rhea County court has granted franchises to the Tennessee Pwr. Co., to J. W. Adams and associates for the interurban line through Rhea County from Chattanooga to Knoxville, and to the Rhea County El. Lt. Co.

LEBANON, TENN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 25 for construction (including mechanical equipment, interior lighting fixtures and approaches) of the United States post office at Lebanon, Tenn., Drawings and specifications may be obtained at the above office or from the custodian of site at Lebanon. O. Wenderoth is supervising architect.

MEMPHIS, TENN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 7, for conduit and wiring system in the United States Marine Hospital, Memphis, Tenn., in accordarce with drawing and specification, copies of which may be obtained at the above office or at the office of custodian, Memphis. O. Wenderoth is supervising architect.

ATHENS, ALA.—At an election to be held Aug. 4 the proposition to sell the municipal electric-light plant to the Alabama Pwr. Co. will be submitted to the voters. The company offers $12,000 for the plant, franchise, etc.

MAGNOLIA, ARK.—The Standard Ice & Lt. Co., of Magnolia, expects to purchase within the next two months incandescent lamps and within the next three months miscellaneous wiring supplies. A. J. Carter is president.

WELSH, LA.—We are informed that the Council is contemplating the installation of a municipal electric-light plant, but as yet no engineer has been engaged. L. E. Robinson is chairman of the special committee appointed to look into the matter.

DARLINGTON, OKLA.—The industrial building at the Masonic Orphans' Home, near Darlington, was recently destroyed by fire, causing a loss of about $30,000. The loss on the light and power equipment is estimated at $8,000.

GOTEBO, OKLA.—The local electric-light plant, owned by H. Weiss, was recently destroyed by fire.

PAWHUSKA, OKLA.—The alfalfa mill, which furnished energy for operating the municipal electric-light and water-works system, was recently destroyed by fire. At present the town is without electrical service. Efforts will be made to rebuild the mill at once.

BUDA, TEX.—It is reported that J. E. Watkins, of Buda, contemplates the installation of a hydroelectric power plant. Mr. Watkins would like to receive catalogs and estimates on water turbines, dynamo and motor equipment for proposed plant.

DALLAS, TEX.—The Texas Trac. Co., it is reported, will soon begin the erection of its large shops near Trinity Heights, in Dallas. The company is now erecting an electric substation near the site of the proposed shops.

DALLAS, TEX.—The Dallas Southwestern Trac. Co., recently organized, contemplates the construction of an electric interurban railway from Dallas to Glen Rose, via Cleburne, a distance of 80 miles, and a branch line from Eagle Ford to Irvin, 10 miles long. The same interests are organizing the Dallas Northwestern Trac. Co., which proposes to construct an interurban electric railway from Dallas to Krum, via Benton, a distance of about 46 miles. Surveys for the proposed lines, it is said, are nearly completed and financial arrangements are reported to have been made. Among the directors are: E. P. Turner, John T. Witt, of Dallas; W. B. Knight, of Mansfield; W. Poindexter and D. Strickland, of Cleburne, and B. M. Sansom of Alvarado.

FORT WORTH, TEX.—The Fort Worth Pwr. & Lt. Co. has increased its capital stock from $3,560,000 to $3,860,000. The company, it is understood, will make improvements to its plant.

HOUSTON, TEX.—The Texas Pub. Ser. Co., of Houston, recently organized to operate in Gilmer, Mount Pleasant, Bay City and Vernon, Tex., contemplates the construction of a power plant. Equipment for the proposed plant has not yet been decided upon. The company will furnish electricity, gas and water. The Robert McCandlish Engineering Co., of Kansas City., Mo., has charge of the engineering work. The Texas company is managed by the Albert Emanuel Co., of Dayton, Ohio.

LULING, TEX.—The City Council is negotiating for the purchase of the local electric-light plant and water-works system. Both plants will be improved, it is said, if taken over by the city.

MARBLE FALLS, TEX.—The city of Marble Falls is contemplating the installation of a municipal electric-light plant and water-works system. The proposed electric plant will have sufficient output to furnish energy for street-lighting, residential and commercial lighting (about 500 houses), and about 300 hp for manufacturing purposes. As yet an engineer has not been appointed. R. E. Johnson is Mayor.

MARFA, TEX.—The Marfa Lt. & Ice Co. is reported to be contemplating the installation of an auxiliary electric-light and power plant in Marfa.

MASON, TEX.—The Mason Ice & Pwr. Co. expects to purchase within the next ten months some wiring supplies. F. C. Beyer is manager.

McGREGOR, TEX.—The McGregor Wtr. & Lt. Co. expects to expend within the next 12 months $300 for meters, $300 in lamps and $100 for electrical appliances and supplies.

PENIEL, TEX.—Arrangements have been made whereby electricity will be secured for operating the local system from the municipal plant at Greenville.

PLANO, TEX.—The Wilcox Lt. & Pwr. Co., of Plano, will do considerable line improvement work in Plano, also in Melisa, Anna and Howard before the winter season. The company has recently installed an electric system in Richardson, furnishing electricity for both lamps and motors. Energy is secured from the Texas Trac. Co., through 19,000-volt, three-phase, 25-cycle Moloney transformers of 75-kva capacity. C. W. Potts is manager.

PLEASANTON, TEX.—The Pleasanton El. Lt. & Pwr. Co. is erecting an electric-light plant here.

ROCKPORT, TEX.—The Rockport Ice & Lt. Co. expects to purchase within the next 12 months poles and wire for its electric system. G. E. Fussell is president and general manager.

SHERMAN, TEX.—Plans and specifications for the new power house to be erected on Austin College campus are reported to have been accepted and work will begin as soon as contract is awarded. Plans are nearly completed for the new administration building, contract for which will soon be let. These buildings are to replace the ones burned last fall.

WEST, TEX.—The Brazos Valley Tel. Co. is contemplating improvements to its system, involving an expenditure of about $10,000.

Pacific States

BELLINGHAM, WASH.—We are informed that the city of Bellingham has entered into a contract with the Puget Sound Trac., Lt. & Pwr. Co. for lighting the streets of the city for a period of three years. The city was recently reported to have voted in favor of the construction of a municipal electric-light plant.

CRESTON, WASH.—The Washington Wtr. Pwr. Co., of Spokane, it is said, will erect at once a transmission line from Davenport to Wilbur, Almira, Hartline, Coulee, Ephrata and Creston.

KIRKLAND, WASH.—The City Council has granted the Puget Sound Trac., Lt. & Pwr. Co., of Seattle, a franchise to furnish electricity for lamps and motors in Kirkland for a period of 50 years. A transmission line will be erected into the city at once, and, it is understood, a substation will be erected near here.

MONTESANO, WASH.—The City Council has granted F. Norton Babo and F. L. Harung a franchise to construct and operate an electric-light plant and water system here. For further information address F. Norton Babo, of Montesano.

MONTE CRISTO, WASH.—The American Mining Co. will soon install a hydroelectric plant (60.-ft. head) in Monte Cristo. Daniel Keyes, of Monte Cristo, is superintendent.

NORTH YAKIMA, WASH.—The Portland Pwr. & Lt. Co., of Portland, Ore., it is reported, will build a 3500-hp auxiliary power plant in the Naches Valley, near its large power plant there, which will soon be placed in operation. D. F. McGee, of Portland, Ore., is chief engineer.

SEATTLE, WASH.—The County Commissioners of Kings County have granted the Puget Sound Trac., Lt. & Pwr. Co., of Seattle, a 50-year franchise to erect transmission lines along the county roads to Kirkland and Redmond, also over certain streets in this city north of Eighty-fifth Street.

SPOKANE, WASH.—Contracts for the electrical installation, wiring, etc., for the Davenport Hotel, now under construction, have been awarded to the Spokane Engineering Co., of Spokane, and to the NePage & McKenna Co., of Seattle, for $21,000.

SPOKANE, WASH.—A special committee has been appointed by the City Council to look into the matter of acquisition by purchase or condemnation of a power site on the Spokane River for a municipal electric-light plant. The cost of building plant and distributing system is estimated at about $2,000,000. C. M. Fassett, Commissioner of Public Utilities, is a member of the special committee.

SPOKANE, WASH.—The Washington Wtr. Pwr. Co., of Spokane, is reported to have purchased the properties of the Idaho-Washington Lt. & Wtr. Co. in St. Maries, Moscow, Troy and Genesee, in Idaho, Tekoa, Farmington, Pullman, Palouse, Garfield, Uniontown, Oaksdale and Colton, in Washington. It is understood that extensions and improvements will be made to the properties. D. L. Huntington, of Spokane, is president of the Washington Wtr. Pwr. Co.

WOODLAND, WASH.—The local electric-light plant, owned by William Lawler, was recently purchased by the Washington-Oregon Corpn., of Chehalis. The new owners, it is understood, will make improvements to the plant.

COQUILLE, ORE.—The Oregon Pwr. Co., of Albany, which was recently granted a 20-year franchise by the City Council, it is reported, will soon begin work on the erection of a transmission line to Coquille. A substation will be erected here.

CORVALLIS, ORE.—At an election held recently the proposition to build a municipal electric-light plant in Corvallis was carried.

ELGIN, ORE.—The Eastern Oregon Co-operative Tel. Association contemplates the erection of several new telephone lines in this territory in the near future. The company, it is said, will issue $30,000 in bonds to carry out the proposed work. J. McKinnis is president of the company.

PORTLAND, ORE.—The City Council has instructed City Commissioner Deick to prepare plans and specifications for lighting the streets of the city. The Portland Ry., Lt. & Pwr. Co. has the present contract for lighting the city, which will soon expire.

SALEM, ORE.—The State Engineering Department has recently announced filings for water rights as follows: To B. T. McBain, of Oregon City, calling for the development of 12,000 hp on the Clackamas River; to the Dry Gulch Co., of Richland, appropriating the water of Eagle Creek for the development of 16,000 hp, and to B. F. Jones, who contemplates the development of 1000 hp on the Siletz River, Lincoln County. Further information may be obtained regarding the above filings by addressing State Engineer Lewis, Salem, Ore.

FORT BIDWELL, CAL.—The installation of an electric-light and power system in Fort Bidwell, to cost about $7,500, is under consideration.

PASADENA, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 11, for construction (including mechanical equipment, interior lighting and approaches) of the United States post office at Pasadena. Drawings and specifications may be obtained from the custodian at Pasadena or from the above office. O. Wenderoth is supervising arcnitect.

QUINCY, CAL.—The local electric-light plant, owned by the Quincy El. Lt. & Pwr. Co., was recently destroyed by fire. It is understood that the plant will be rebuilt at once. F. G. Gansner is manager.

SAN FRANCISCO, CAL.—The State Railroad Commission has granted the Pacific Gas & El. Co., San Francisco, authority to purchase ditches and water rights from the United Wtr. & Pwr. Co. The water rights thus acquired are to be used for further developments of the Bear River hydroelectric projects in Placer County.

SAN FRANCISCO, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 2, for construction (including mechanical equipment, interior lighting fixtures and electric protection) of two interior money vaults for the new building for the United States Sub-treasury at San Francisco. Drawings and specifications may be obtained from the superintendent of construction, San Francisco, or at the above office. O. Wenderoth is supervising architect.

HAILEY, IDAHO.—The Cramer El. Co., of Hailey, expects to erect within the next two months a 6600-volt transmission line north to Ketchem, a distance of 2 miles, and west to mines now using steam, about 4 miles distant. M. B. Herron is superintendent.

MINIDOKA, IDAHO.—The Secretary of the Interior has directed the Reclamation Service to execute a contract with the Standard Underground Cable Co., of Los Angeles, for furnishing copper wire for the Minidoka irrigation project. The contract amounts to $14,056.

MOUNT PLEASANT, UTAH.—The city of Mount Pleasant is building a new power plant, which will probably be completed in about two months. The city, it is understood, will take over the electric plant of the Mount Pleasant Mill & Pwr. Co. in August. A. C. Wall is manager of the Mount Pleasant company.

ST. GEORGE, UTAH.—Within the next two months two blocks of high-voltage distribution line will be erected to furnish energy to the Nelson Mercantile Co., the St. George Ice Co. and the St. George Amusement Co. The city expects to purchase within the next six months 1000 ft. of 12-in. penstock for the municipal power plant, one high-pressure governor and 12 5-amp meters. M. Kemp is city electrician.

PHOENIX, ARIZ.—The board of governors of the Salt River Valley Water Users' Association has awarded the contract for construction of a new electric-power station at the Hole-in-the-Rock to Marin & Gallis, of Phoenix.

PHOENIX, ARIZ.—The Salt River Valley Water Users' Association, of Phoenix, expects to erect within the next nine months a power house for a 6000-hp hydroelectric power plant. All equipment for proposed plant has been purchased. The association sells energy at wholesale.

GRAND JUNCTION, COL.—The Grand Junction El. Gas & Mfg. Co. and the Grand Junction & Grand River Valley Ry. Co. have offered their entire holdings, which include the electric, gas and ice plants, the city street-car system and the interurban railway to Fruita, to the city of Grand Junction for $1,333,000. Eugene A. Sunderlin, of Colorado Springs, is president of both companies.

RICO, COL.—The Rico Mining Co. has just installed three 60-hp boilers, one 125-hp Ideal steam engine, and one 200-hp waterwheel, giving the plant a total output (steam and hydroelectric power) of 350 hp. The company furnishes electricity to a quartz mill operated by the Rico Wellington Co., of Provo, Utah. George E. Hicks is superintendent of power station.

Canada

EDMONTON, ALTA.—The Canadian government, it is said, will erect 2400 miles of rural telephone lines during the remainder of the year. The cost of the work is estimated at $2,000,000. For further information address W. J. Harmer, deputy minister of telephones.

MEDICINE HAT, ALTA.—By-laws have been voted for municipal improvements as follows: For extensions to water-works system, $85,000; for new water-works south of the town, $225,000; for fire apparatus, $17,000, and for electric-light plant, $67,000.

REVELSTOKE, B. C.—The municipal lighting plant is erecting a 10-wire lead 1½ miles long and is installing a tungsten street-lighting system, for which the material has been purchased. C. North, superintendent electrical department.

VANCOUVER, B. C.—The British Columbia El. Ry. Co. experts to complete within the next four months two hydroelectric generating stations and one 17-mile 60,000-volt transmission line, one 60,000-11,000-volt transformer station and three substations. W. V. Hunt is electrical engineer.

FREDERICTON, N. B.—The Fredericton Gas Lt. Co. has purchased and expects to install within the next three months a 375-kw Westinghouse Parsons turbine and Wheeler condensing apparatus, exciter set, air pump, circulating pump, etc., and switching equipment for above equipment. Luke S. Morrison is secretary.

AMHERST, N. S.—The contract for the extension to the South Park Street transformer station of the Maritime Coal, Ry. & Pwr. Co. has been awarded to Rhodes, Curry & Co.

CHIGNECTO, N. S.—The Maritime Coal, Ry. & Pwr. Co. has awarded the contract for extension to its electric power station in Chignecto, to J. N. Page, of Amherst. It is understood that steam and electric equipment will be required.

AURORA, ONT.—On Aug. 4 by-laws will be submitted to the ratepayers asking for an appropriation of $15,000 to provide for the purchase of pumps at a cost of $5,000 and $10,000 for improvements to the electrical distributing system. The ratepayers recently voted to secure energy from the Toronto & York Radial Ry. Co.

GODERICH, ONT.—The Town Council contemplates installing a lighting system for parks and bridges.

LONDON, ONT.—The townships of McGillivray and East and West Williams, in Middlesex County, and Hay, Stephen and Bosanquet, in South Huron, are considering the development of a hydroelectric plant on the Au Sable River, to cost about $100,000.

NORTH TORONTO, ONT.—Arrangements are being made to discard the present street-lighting system and install lamps similar to those in use in the city of Toronto, at a cost of about $40,000.

OTTAWA, ONT.—Tenders will be received by the city of Ottawa until Aug. 14 for furnishing 47,000 ft. of underground lead-covered cables and 14 induction regulators. Specifications may be obtained from J. E. Brown, electrical superintendent.

TORONTO, ONT.—The ratepayers of Ayr and the neighboring villages of Princeton, Drumbo and Plattsville on July 21 voted in favor of by-laws to contract with the Hydro-Electric Power Commission for electrical service.

TORONTO, ONT.—The Hydro-Electric Power Commission of Ontario has decided upon immediate development and expansion of the hydroelectric system. Contracts have been awarded for the construction and equipment of the plant at Wasdell's Falls, where the commission will undertake its initial project of generating its own power. Contracts have also been awarded for the enlargement of the Dundas, London and St. Johns stations and for the construction of Prescott transformer station.

WALLACEBURG, ONT.—The Premier El. Lt. & Pwr. Co., of Wallaceburg, is erecting a 150-hp gas engine and a 250-kva alternator, driven by gas engine on one side and steam engine on the other. The plant is being changed from 133 to 60 cycles. The company has amalgamated with the gas company and is now known as the Wallaceburg Gas Co., Ltd. W. R. Waghorne is manager.

BUCKINGHAM, QUE.—The Electric Reduction Co., Ltd., of Buckingham, is installing a hydraulic development of about 3200 hp. It is understood that about one-half of the power will be utilized to generate electrical energy. W. A. Williams is managing director of the company.

WOLSELEY, SASK.—The Central Lt. & Pwr. Co., of Wolseley, expects to erect within the next two months one 30-kw, 60-cycle, 2300-volt generator in connection with its auxiliary 50-hp oil engine, belt-driven, to relieve the 50-kw generator now in use; also to purchase within the next three months 50 electric irons and 20 washing machines, and to furnish a day service two mornings per week for same. Within the next two months it is expected that a by-law will be voted authorizing the purchase of this plant by the town. Charles Stengal is manager of the company.

YORKTON, SASK.—The managers of the municipal electric-light plant expect to erect within the next three months one 500-hp Diesel engine directly connected to a 400-kva, three-phase Siemens & Halske alternator and Westinghouse switchboard; also to purchase within the next six months a 500-hp direct-connected unit (Diesel engine), Tirrill regulator and 65 lamp standards (five-lamp clusters). M. M. Inglis is superintendent.

Miscellaneous

CIENFUEGOS, CUBA.—The Cienfuegos El. Lt. & Pwr. Co. has purchased the property and franchises of Octavio M. Font & Co., who owned and operated the local electric-light plant. Octavio M. Font has been appointed general manager of the company.

MELBOURNE, AUSTRALIA.—The Postmaster General at Melbourne, Australia, invites tenders for cables, telephones, switchboards, etc., as follows: For 105 miles of paper-insulated, lead-covered cable (Schedule 906); 300 coin collecting devices, electrically controlled (Schedule 916); telephones (Schedule 301); switchboards (Schedule 302) and electric lamps (Schedule 304). Particulars may be obtained of the High Commissioner for the Commonwealth of Australia, 72 Victoria Street, London, Eng.

MELBOURNE, AUSTRALIA.—Tenders will be received at the office of the Deputy Postmaster-General, Melbourne, Australia, until Sept. 16, for switchboards and telephone parts as follows: (1) An automatic or semi-automatic switchboard and parts (Schedule 859); a common-battery multiple switchboard (Schedule 860). Copies of specifications and forms of tender may be obtained from the High Commissioner for the Commonwealth of Australia, 72 Victoria Street, London, Eng.

New Incorporations

DOVER, DEL.—The Rising Sun Water, Lt. & Pwr. Co., of Dover, has been incorporated with a capital stock of $15,000. M. Hirons, of Dover, is principal incorporator.

WAPWALLOPEN, PA.—The Wapwallopen El. Co. has been incorporated with a capital stock of $5,000.

Directory of Electrical Associations, Societies, Etc.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, Matthew R. Boylan, Public Service Railway Co., Newark, N. J. Annual convention, Atlantic City, N. J., Oct. 13-17.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, H. C. Donecker, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 13-17.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, H. C. Donecker, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 13-17.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Semi-annual meeting, Denver, Sept. 9-11.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio. Annual meeting, Atlanta, Ga., December.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y. Annual meeting, May, 1914.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark. Annual meeting, May, 1914.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal. Annual meeting, Cooperstown, N. Y., Sept. 8-11.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, James Farrington, Steubenville, Ohio. Annual meeting, New York, Sept. 22-27.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago. Annual meeting, Chicago, Oct. 20-24.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago. Annual meeting, New Orleans, May 19-22, 1914.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal. Annual convention, Santa Barbara, Aug. 16.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, H. G. Martin, Toronto Electric Light Co., Ltd., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col. Annual meeting, Denver, Oct. 6.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, Thomas F. Kennedy, 900 15th St., Denver, Col. Annual meeting, Denver, Oct. 6.

ELECTRIC CLUB OF CHICAGO. Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Blumenthal, 179 West Washington Street. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Ernest S. Cowie, 1613 Grand Ave., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis. Annual meeting, Aug. 7-12.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago. Annual meeting, Chicago, November.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL DEVELOPMENT ASSOCIATION, INC. Secretary, Zenas W. Carter, 53 State St., Boston, Mass.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Annual meeting, February or March, 1914.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, Harvey Robinson, 124 West 42d Street, New York. Annual convention, Chicago, Oct. 27 and 28.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA, NEW ENGLAND SECTION. Secretary, L. L. Edgar, 39 Boylston St., Boston.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York. Annual meeting, New York, October.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual meeting, May, 1914.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh. Annual meeting, Pittsburgh, Sept. 22-26.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary and treasurer, J. V. Zartman, 49 Lombard Building, Indianapolis, Ind. Annual meeting, Indianapolis, Sept. 24 and 25.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York. Annual meeting, New York, Sept. 5.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 81 New St., New York. Annual meeting, New York, January, 1914.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex. Annual meeting, Watertown, N. Y., Aug. 19-22.

INTERNATIONAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary, J. A. Barr, Exposition Building, San Francisco, Cal. San Francisco, Sept. 13-18, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Next plenary meeting, Berlin, Sept. 2-6, 1913. Meeting at San Francisco, Sept, 6-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, H. B. Maynard, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia. Annual meeting, Cedar Rapids, April 23, 1914.

JOVIAN ORDER. Jupiter (president), F. E. Watts, 239 West 39th St., New York; Mercury (secretary), E. C. Bennett, St. Louis, Mo. Annual meeting, Hotel Astor, New York, Oct. 14-16.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. H. Bower Spangenberg, 625 Poydras St., New Orleans, La. Meets second Thursday of each month.

MAINE ELECTRIC ASSOCIATION. Secretary, Walter S. Wyman, Waterville, Maine.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION (affiliated with the National Electric Light Association). Secretary-treasurer, Frank J. Duffy, Natchez, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis. Annual meeting, May, 1914.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago. Annual meeting, June, 1914.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRIC LIGHT ASSOCIATION, COMMERCIAL SECTION. Secretary, E. L. Callahan, 29 West 39th St., New York.

NATIONAL ELECTRIC LIGHT ASSOCIATION, EASTERN NEW YORK SECTION. Secretary, R. E. Russell, Schenectady, N. Y.

NATIONAL ELECTRIC LIGHT ASSOCIATION, SOUTHEASTERN SECTION. Secretary-treasurer, M. H. Hendee, Augusta, Ga. Annual meeting, Macon, Aug. 14-16.

NATIONAL ELECTRIC LIGHT ASSOCIATION, HYDROELECTRIC AND POWER TRANSMISSION SECTION. Secretary, L. H. Conklin, Scranton, Pa.

NATIONAL ELECTRIC LIGHT ASSOCIATION, MICHIGAN SECTION. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich. Annual meeting, Ottawa Beach, Aug. 19-21.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEBRASKA SECTION. Secretary-treasurer, S. J. Bell, David City, Neb.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEW ENGLAND SECTION. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual convention, Burlington, Vt., Sept. 17, 18, 19.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NORTHWEST SECTION. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash. Annual meeting, Seattle, Wash., Sept. 10-12.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk Street, Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, Richard Valentine, Janesville, Wis.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRICAL CREDIT ASSOCIATION (affiliated with the National Electrical Credit Association). Secretary, Franz Neilson, 80 Wall St., New York. Annual meeting, Dec. 9.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York. Annual meeting, New York, June, 1914.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 598 Broadway, Albany, N. Y.

NORTHWESTERN CEDARMEN'S ASSOCIATION. Secretary, N. E. Boucher, 743 Lumber Exchange, Minneapolis, Minn. Annual meeeting, Jan. 6, 1914.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio. Annual meeting, Columbus, Ohio, Nov. 20-22.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. E. Kilkenny, St. John's, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, Walter E. Long, 100 Chestnut St., Philadelphia, Pa. Annual convention, Delaware Water Gap, Sept. 16-18.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. E. Rosenberg, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. Secretary-treasurer, Philip S. Dodd, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Prof. H. H. Norris, Ithaca, N. Y. Annual meeting, Princeton, N. J., June, 1914.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Manchester, Vt. Annual meeting, Burlington, Vt., Sept. 18.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill. Annual meeting, Cincinnati, Jan. 27-29.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, Stephenson Building, Milwaukee, Wis. Annual meeting, Jan 15 and 16, 1914.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JULY 22, 1913.

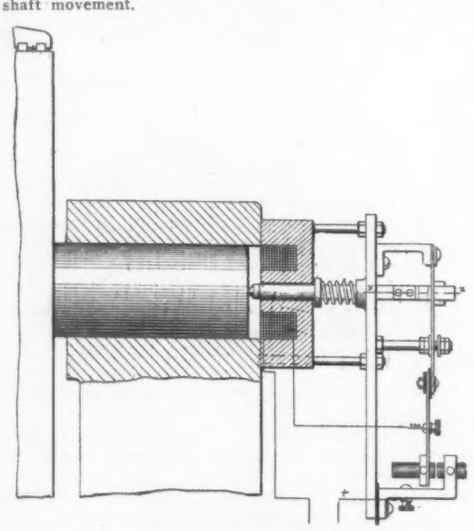
[Prepared by Robert Starr Allyn, 15 Exchange Place, New York.]

1,067,795. FURNACE; J. W. Brown, Lakewood, Ohio. App. filed Dec. 1, 1911. While one body of material is being heated, an additional body is passed around the chamber containing the first body so as to absorb some of the heat thereof. Chambers concentric with electrodes in the different chambers.

1,067,817. TIRE-HEATING FORGE; N. L. Jones, Temperanceville, Va. App. filed April 28, 1913. Plurality of fire pots with a bellows supplying air equally to all fire pots.

1,067,823. RESONATING RELAY; H. Von Kramer and G. Kapp, Birmingham, Eng. App. filed April 11, 1912. Has vibratory steel reed tuned to periodicity of the alternating current in the controlling circuit.

1,067,864. END-PLAY DEVICE; G. W. Christians, New York, N. Y. App. filed Jan. 30, 1913. Natural reciprocation of the shaft of the machine is utilized to close a circuit through a magnet which amplifies the shaft movement.



1,067,864.—End-play Device.

1,067,869. ELECTRIC-HEATING UNIT; B. Falkenberg, Ontario, Cal. App. filed May 27, 1912. Thin, flat electrical resistance is held between two flat plates having interfitting flanged edges.

1,067,880. RESISTANCE INCLOSURE; C. A. Rhine and C. H. Keeney, Milwaukee, Wis. App. filed Aug. 20, 1910. For starters, controllers, etc.; provides ample ventilation for the resistance but prevents issuance of spark or flame from the inclosure.

1,067,936. ELECTRIC SWITCH; H. R. Mitchell, North Yakima, Wash. App. filed Feb. 15, 1912. Combination of locking bolt and signaling switch for mail boxes and the like.

1,067,951. COVERING FOR ELECTRIC CONDUCTORS AND METHOD OF PREPARING THE SAME; E. T. Trotter, Brooklyn, N. Y. App. filed Nov. 8, 1910. Treats the insulation of an ordinary insulated conductor with stearine pitch and manganese oxide.

1,067,974. METHOD OF DISCHARGE OF ELECTRICITY INTO GASES; F. G. Cotterell, Berkeley, Cal. App. filed Nov. 6, 1911. Exposes to the gas a surface facilitating a non-disruptive discharge and applies a negative potential to such surface.

1,068,010. SOSTENUTO DEVICE FOR MUSICAL INSTRUMENTS; M. L. Severy and G. B. Sinclair, Winthrop, Mass. App. filed May 3, 1907. For causing one or more actuated springs to remain sounding as long as desired; may be mounted at will into and out of control of the keys.

1,068,023. RAILWAY-TRAIN-CONTROL APPARATUS; J. T. Thompson, Chicago, Ill. App. filed March 18, 1910. Track-in-circuit system for controlling and automatically stopping train.

1,068,024. SIGNAL OR CONTROL MECHANISM FOR RAILWAY TRAINS; J. T. Thompson, Chicago, Ill. App. filed Jan. 5, 1912. Train will not be stopped when running below a certain speed.

1,068,065. HEATING APPARATUS; G. F. Machlet, Jr., Elizabeth, N. J. App. filed Jan. 27, 1908. Furnace-regulating device with a galvanometer whose needle is operated by the heat of the furnace, the galvanometer serving as an indicating device as well as a circuit controller.

1,068,076. RECEIVER FOR ELECTROCHEMICAL TELEGRAPH SYSTEMS; W. K. Queen and T. F. Pickett, Needham Heights, Mass. App. filed June 10, 1910. For ship telegraph systems between pilot house and engine room; receiver is controlled electrically and actuated mechanically.

1,068,082. DANGER SIGNAL; J. H. Sanor, Canton, Ohio. App. filed Nov. 28, 1908. Wheel-actuated spring contacts bridge the insulated joints of the rails.

1,068,148. ELECTRODE HOLDER FOR ELECTRIC FURNACES; D. A. Lyon and E. R. Cox, Jr., Heroult, Cal. App. filed Oct. 8, 1910. Gas-tight compressible clamp for the electrode.

1,068,192. CASE FOR INCANDESCENT-ELECTRIC-LAMP SOCKETS; A. Weber, Sr., and J. Weber, Schenectady, N. Y. App. filed Jan. 16, 1909. Multiple lock for cap and shell of a lamp socket.

1,068,216. AUTOMATIC HEAT REGULATOR; A. P. Broomell, York, Pa. App. filed Oct. 4, 1912. Thermally controlled electromagnet for operating a valve.

1,068,233. THIRD-RAIL SUPPORT OR CHAIR; J. S. Fox, Jackson, Mich. App. filed Dec. 27, 1912. Curved flexible holder is drawn up into the curved head of the supporting standard thereby to clamp against the conductor rail.

1,068,255. SIGNALING DEVICE; M. J. Mandelbaum, New York, N. Y. App. filed Nov. 7, 1912. Manually operated electrically lighted stop and turn-out signals mounted at rear of automobile.

1,068,322. HEATER; L. E. Church and J. A. Cooney, Bartlesville, Okla. App. filed Oct. 22, 1912. Electrical heater interposed in the intake manifold of a gas engine.

1,068,335. BRUSH HOLDER FOR DYNAMO ELECTRIC GENERATORS OR ELECTRIC MOTORS; J. E. Grant, Battersea, London, Eng. App. filed Nov. 5, 1912. Copper "flexible" of the carbon brush is secured in a spring clamp carried by the brush holder.

1,068,341. FUSIBLE CUT-OUT FOR CONTROLLING ELECTRIC CIRCUITS; V. Hope, Manchester, Eng. App. filed June 13, 1912. Fuse consisting of a copper core with a sheathing therefor of tin-lead alloy.

1,068,343. ELECTRICALLY HEATED GLUE POT; A. C. Hulbert, San Francisco, Cal. App. filed April 17, 1912. Combined steam and electrical controlling apparatus maintains substance heated at a given temperature.

1,068,387. ELECTRIC SIGNALING; F. B. Herzog (deceased), New York, N. Y. App. filed July 20, 1889. Single-line signaling system in which interference between simultaneously operated substations is prevented.

1,068,388. APPARATUS FOR CLEANING GOLD, SILVER AND OTHER METAL WARE; J. M. Hotchkiss, Burlington, Vt. App. filed April 12, 1912. Zinc tray with utensil-supporting copper rack disposed in a sodium-chloride electrolyte.